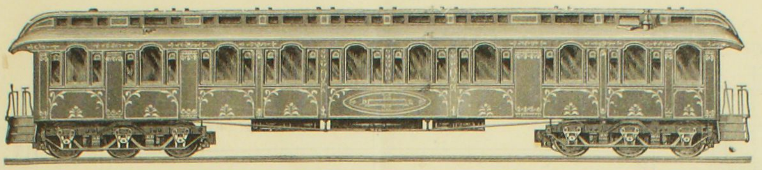
NATIONAL CAR AND LOCOMOTIVE BUILDER.



VOLUME XVIII. NUMBER 1. | JANUARY, 1887. | SINGLE NUMBERS, TEN CENTS, $1.00 PER ANNUM.

Miscellaneous Items.

IT is reported that the Union Pacific Railroad Co. have decided to adopt the 24 o'clock time system on all its lines, and that the watches and clocks of the road are being changed to conform to the new style of recording time.

THE elevated railways of New York city carried 13,214,-573 passengers during the month of November as against 8,955,976 in November, 1885, being an increase of 4,258,597, or 141,953 per day. Notwithstanding the reduction of fare, the returns for November show a gain of $76,589.28 in revenue received.

A NEW machine for making railroad car coupling pins is in successful operation by the Pittsburgh Forge and Iron Works, by which 35 pins can be made in a minute. One thousand pins made in the old way was considered a big day's work. In a day's work of ten hours the machine can turn out at least 15,000 pins. A machine for making coupling links is soon to be put up which will turn out about 25 links per minute. The process is precisely the same.

THE measuring of the candle power of a light is accomplished by comparing the shadow cast by a rod in the light of a standard candle with the shadow cast by the light to be tested. By moving the latter toward or away from the rod a point will be reached at which the shadow cast by both lights will be of the same intensity. The intensity of the two lights is directly proportional to the squares of their distances from the shadows, *i. e.*, suppose the light to be tested is three times the distance of the candle, its illuminating power is nine times as great.

IN speaking at the Western Railway Club on locomotive driving wheel centers, Mr. J. N. Lauder, of the Old Colony Railroad, said: "The adoption of certain sizes does not go far enough. For instance, we adopted 62 inches for the ordinary passenger wheel. Now, it wouldn't do for all of us to go to work and make gauges of 62 inches and bore out the wheels by them or turn our wheel centers by them, for no two men can take the same rule or measuring machine and measure 62 inches and get the measurements alike. The two men will vary enough to make it fatal in the matter of uniformity. Unless we can have absolute uniformity we cannot get our tires of the manufacturers—which I think will come under this system—we cannot get our tires bored with that absolute certainty that we ought to have. If we are going to adopt uniform sizes of wheel centers there is an absolute necessity for having uniform gauges by which to turn our centers and tires."

THE latest development of the railway car has made its appearance in Russia, where the employés of the great Southwestern road recently petitioned the management that facilities might be given them for attending to their religious duties on board the trains. There are so many saints' days in that country that the brakemen and engine drivers have hitherto found it difficult to be pious and attend to their work at the same time. Now, however, this has been rendered possible on the railway aforesaid by the attachment to every train on holy occasions of a saloon carriage fitted up with an altar and wax candles, like a church of the orthodox rite. Here the conductor and the stoker can unite in prayer under the superintendence of the traveling priest, and the accidents which will naturally attend upon indulgence in so much religious devotion will simply have the very desirable effect of discouraging the profane from riding in the cars on the Lord's days.

WHEN the average reporter for the daily papers proceeds to give details of accidents to engines, he generally manages to mix things up. We nave often seen ludicrous descriptions gotten up in this way, but do not remember anything so chaotic as the following account of an engine breakdown copied by the *American Machinist* from an English paper:

"A serious breakdown occurred last Saturday morning at the mill of Mr. T. Moss, Kirkham, resulting in the stoppage of the works for a considerable period. The accident happened to the new engine recently erected on the newest and most economical principle. The chief engineer when on duty heard a bumping of the engines. On going to the sluice valve to shut off steam he found that the vacuum had dropped in the valve and jammed it. On examination of the engines it was found that the piston rod, which runs the ball-thrust bearings, had become bent through one of the bearings becoming deranged. The links connecting the piston rod with the piston broke through, a bolt being eaten away by an accumulation of matter in the cylinder, which resulted also in a broken piston."

Demand for Car Lumber.

The *Northwestern Lumberman* says: "The demand is urgent and increasing, and yards that have ample stocks of the requisite sizes and grades are doing considerable business in this class of lumber alone. The call is for white pine car roofing, white pine car siding, Norway decking (flooring) and Norway strips for lining. The roofing must be clear and A, and the siding B grade. The roofing requires stuff 5 ft. long, so that 10-ft. strips and 16-ft. strips can be cut into roofing. Short lumber is always priced relatively lower than 16-ft lumber, but the supply of the short is now so nearly used up, while the demand for it is on the increase, that the tendency is to lift up the price of the short to a level with that of the long. This will bring the long in quicker demand, for sellers, when they find out that the value of short is about equal to that of the long, will cut their 16-ft. lengths into car roofing, making three 5-ft. pieces of each. In that case there will be a waste of a foot that will have to be accounted for in some way. The sides of cars are mostly made of 4-in. B flooring strips, though a crying demand may drop the grade into C. They must be 8 ft. long, so that 16-ft. lengths can be cut in two for this purpose. Decking or flooring requires 2 by 6 Norway. The demand is for 18-ft. lengths, which can be cut in two."

Charity Calls on the Brotherhood of Locomotive Engineers.

Although there is a good and reliable insurance department connected with the Brotherhood of Locomotive Engineers' membership, the insurance is not compulsory, and many members neglect to carry insurance. Vigorous efforts have been made several times to make membership of the insurance compulsory with all members of the brotherhood, but a rule to that effect has never been carried. The greatest obstacle in the way of carrying a rule of this nature, is the fact that a great many of the members have been insured in outside companies before they become entitled to join the Brotherhood, and it is considered undesirable to burden such men with double insurance policies. In spite, however, of the hazardous nature of a locomotive engineer's calling, there are many well paid members who carry no insurance whatever, and the Brotherhood is annually solicited to extend aid to widows and orpans of such men, who are suddenly left destitute. The revenues of the monthly *Journal* are always devoted to relieving distress of this kind, but the money is inadequate to meet a tithe of the wants presented. At last convention sums aggregating nearly seven thousand dollars were paid out in charity to people who really had no claims on the organization. A very beneficent act of power on the part of the Brotherhood of Locomotive Engineers, would be the enactment of a rule compelling members to carry insurance policies of some kind.

Boston & Lowell Rolling Stock.

From Mr. J. R. Taylor, superintendent of rolling stock and machinery of the Boston & Lowell Railroad, we learn that his department has carried out important improvements during the past year. The company built two new passenger locomotives at their shops at Concord, and have now on hand two new switching engines. A conspicuous feature about the engines is their large boiler. All the engines have extension fronts and all other approved appliances for promoting economy and convenience in operating. They are also building a large passenger engine at East Cambridge. They have bought during the past year four large ten-wheel freight engines from the Schenectady Locomotive Works, and five passenger and two switching from an Eastern contract shop. They have rebuilt four of their own engines.

In the car department they have had a considerable increase of equipment. Osgood Bradley & Son, of Worcester, Mass., are building for the company 20 day coaches, which will be 60 feet long. They will have the Mann roof, and will be furnished and equipped the same as those built lately by the Boston & Albany road, and now run upon their New York trains. Other parties are building more cars of the same kind. The company have the building of several lots of freight cars contracted for. Among these are one lot of 100 flat cars of 40,000 pounds capacity, 100 box cars 34 feet long and 40,000 pounds capacity, and 75 gondola coal cars of 50,000 pounds capacity, all the freight and coal cars to be equipped with the United States Automatic draw-bars. In the company's shops at Concord and at East Cambridge there are five new combination cars in course of construction. These will be 60 feet long, with seating capacity for 54 passengers, the remainder of the space being devoted to baggage. All these cars will be handsomely finished and equipped with all modern improvements.

How Queen Victoria Travels.

An English paper thus describes the way in which the Queen travels during her visits to Scotland:

"Never were greater precautions taken to secure the safety and comfort of a sovereign when traveling, as the following few details will illustrate: To begin with, the royal train was fitted with an electrical communication between the compartments of each saloon carriage and the guard's, and telegraph men accompanied the train with the necessary instruments and appliances for establishing communication in case of necessity. Then a lookout man was placed on the engine-tender, with his face toward the rear of the train, so as to be ready to receive and communicate to the driver any signal that might be given; and the guard in the front van had to keep his face constantly toward the rear of the train on the lookout for any signal from the guard in the rear, or from any of the attendants accompanying the train. Beyond this surfacemen were stationed at all the level crossings, and no vehicle of any kind was allowed to pass for half an hour before the royal train was due. The goods traffic also on both lines was suspended during the progress of her Majesty, and the speed of the passenger trains proceeding in an opposite direction was reduced to ten miles an hour while the royal train was passing them on the other line. Precious lives must be jealously guarded, we know. But so complicated were the precautions for the Queen's safety that it seems to us a new danger must thereby have been created. The royal train consisted of twelve vehicles, including two royal saloons elegantly fitted up, and the string was so arranged that these carriages were exactly in the middle. Following the engine was a brake-van, next a first-class carriage for man-servants, a carriage for pages and upper servants, one for dressers and ladies' maids, then a carriage containing Lady Waterpark and the Hon. Horatia Stopford; next came the Queen's saloon, the front part of which was occupied by personal servants and dressers, and the private portion by her Majesty and the Princess Beatrice; then followed a second royal saloon, in which was Prince Henry of Battenberg; next a carriage containing Viscount Bridport, Sir Henry Ponsonby, Major Edwards and Dr. Reid; two carriages for the directors and officials of the railway companies, the 'Queen's fourgon'—a carriage containing the royal plate—and the rear was brought up by another brake-van."

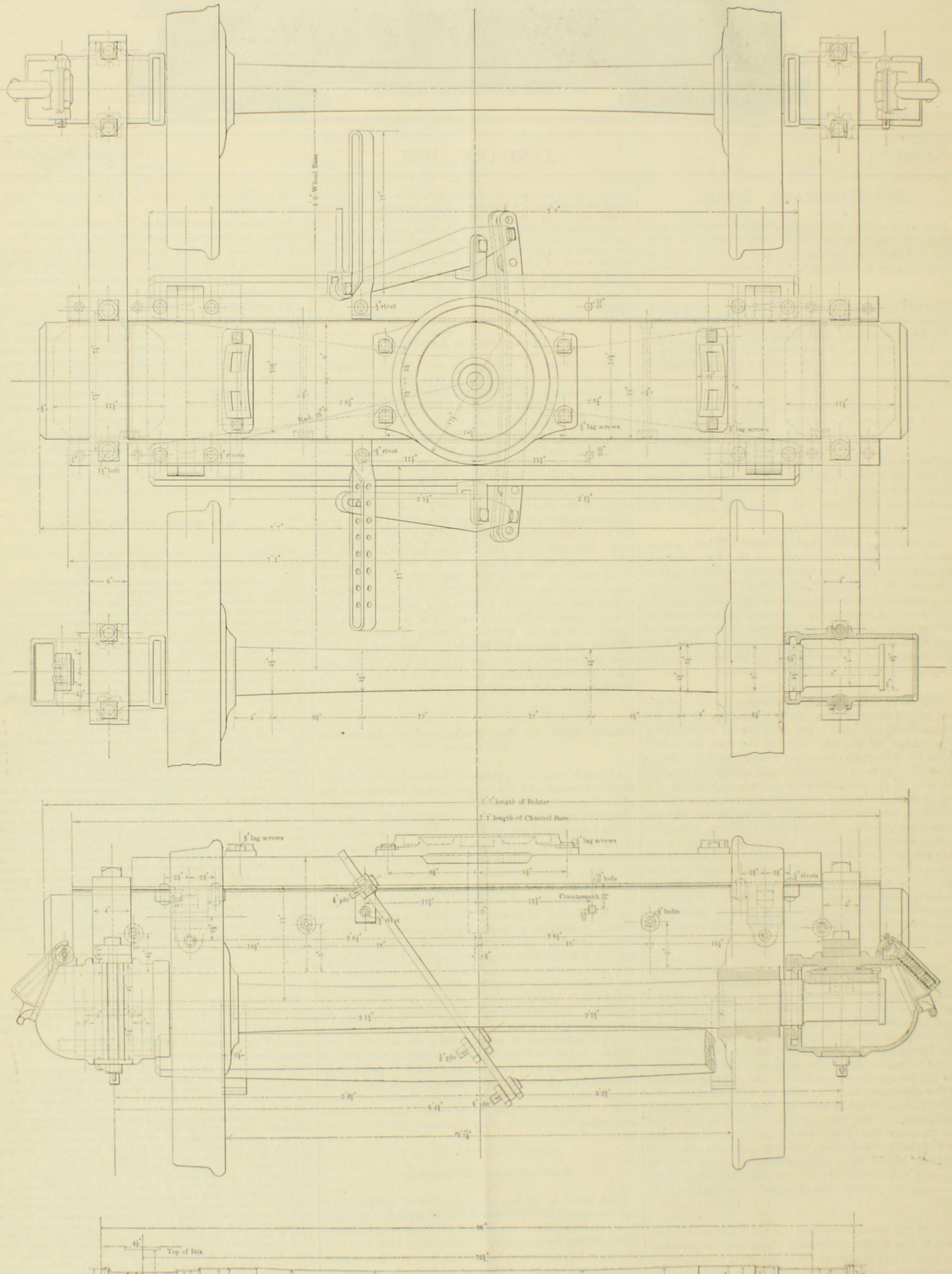
Old Colony Railroad.

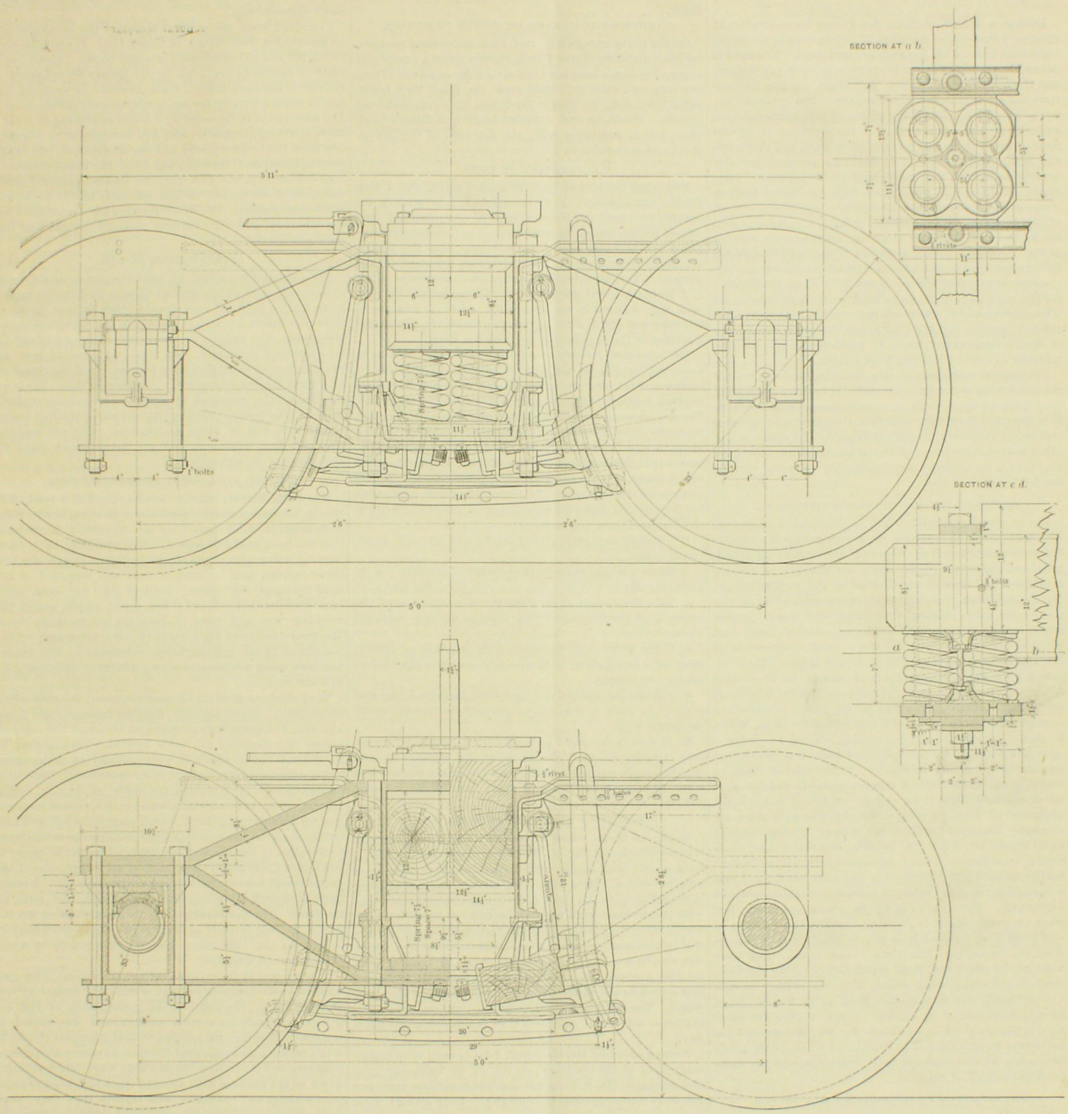
The annual report of the company for the year ending Sept. 30, 1866, shows a prosperous and increasing business as compared with that of the previous year. Of the rolling stock equipment, of which Mr. James Lauder is the superintendent, the report says:

"The equipment of the road has been quite largely increased during the past year; 7 locomotives, 22 passenger cars, 2 parlor cars, 3 baggage cars, 1 flat car, 1 caboose car, 2 derrick cars, 75 box cars and 51 dump cars have been built or purchased. A portion of these replaced cars and engines were condemned, but most of it was additional, and increased the value and efficiency of the equipment, which was as follows on Sept. 30, 1886: Seventy-four passenger, 41 freight and 18 switching locomotives, 12 parlor cars, 255 passenger cars, 42 baggage cars, 19 box cars (air brakes), 25 34-foot box cars (air brakes), 25 34-foot box cars, 2 40-foot express box cars, 750 long box cars, 29 machinery cars, 67 20-foot box cars, 67 short box cars, 7 hay cars, 5 milk cars, 7 derrick cars, 4 scraper cars, 5 tool cars, 34 long caboose cars, 6 short caboose cars, 618 long platform cars, 31 cattle cars, 61 six-wheel stone cars, 5 short platform cars, 1,205 coal cars, 100 gravel cars, 12 service cars (taken from passenger equipment). During the summer, when the passenger traffic is the greatest, the equipment is taxed to the utmost to meet the public demand, and further additions are required and will be made before next summer. 4,273 tons of steel rails have been laid down during the year. The new rails weigh 67 pounds per yard. A new engine house, with stalls for 12 engines, and a coal shed to hold 6,000 tons of coal, at South Framingham, are well advanced. No other new work upon station buildings is now going on, but additional accommodations must be provided at an early day at several important places. The increasing business of the company has made necessary the purchase of additional land in many places. About 125 acres have been bought in South Braintree with a view to the removal of the car shops to that place. The shops built at that time when the company had less than 75 passenger and baggage cars, have proved inadequate when the number had increased to more than 300."

FREIGHT CAR TRUCK—PENNSYLVANIA RAILROAD.

Approved March 1, 1886. Theo. N. Ely, Gen. Supt. Motive Power. Jno. W. Cloud, Mechanical Engineer.





The engravings represent a new freight car truck, built at Altoona, and recently put in service on the Pennsylvania Railroad. Its chief peculiarity consists in dispensing with the spring-plank, which is done by carrying the springs in a stirrup directly under the arch-bar, the stirrup being bolted to the upper and lower bars as shown. The end of the bolster is cut away at the top to make room for the upper bar, which is extra heavy. The brakes are hung from the flange of the channel-bar transoms, thus avoiding the vertical motion to which they are subject when attached to the bolster.

The form and dimensions of the axle are also shown.

Effect of Heavy Driving Wheels.

The following letter was read at the last meeting of the Western Railway Club, by Mr. C. E. Smart, general master mechanic of the Michigan Central Railroad :

"I was very much interested in an article in the December number of the NATIONAL CAR AND LOCOMOTIVE BUILDER, headed 'Startling Discoveries About the Wear of Locomotive Tires,' and also surprised at the results of Mr. Rhodes' investigations. It will, perhaps, be remembered that at the close of the meeting of the Western Railway Club of October I made a few informal remarks regarding the subject of discussion at the next meeting, viz., 'Section of Tire and Wheel Centers,' at which time I expressed myself to the effect that in my opinion we were in many cases using very heavy driving wheels, having in my mind at the time fifty-seven inch wheel centers weighing, in round numbers, 2,750 pounds, with an addition of a three and a half inch tire, giving an additional 1,100 pounds, making an aggregate of 3,850 pounds to each wheel, and that I thought it desirable that the matter be discussed as to whether we might not be benefited by having less weight in driving wheels, even if we had to use better material in the manufacture of centers.

I have not sufficient data at hand to give me assurance that I am correct in my theory, neither do I claim that I am correct regarding the injurious effect due to heavy wheel centers and thick tires. The extra thickness of tire adds materially to the weight of wheels, and we have in many cases from 30 to 35 per cent. more weight in the wheels than is requisite to give the necessary strength for safety and durability ; and yet it is a fact that our steel tires in many cases do not give such great amount of mileage more per $\frac{1}{16}$ inch of wear than we used to get when we used light wrought iron wheel centers and light two-inch tire. With these considerations, it suggested itself to my mind quite forcibly that a part at least of the unusual wear of the tire may safely be attributed to the effect of heavy wheel centers and tires and improper and heavy counterbalancing as well ; and the excessive wear of the four-inch tire as compared with a three-inch tire may, perhaps, in part be attributed to the extra weight in the four-inch tire.

The question which I should very much like to hear discussed is, whether it would not be better to reduce the weight of our wheel centers to the lowest possible limit consistent with durability and safety, by using gun metal or even steel, and to transfer the weight from the driving wheels, and if necessary, use it in increasing the size of the boiler or adding to the frame as may be thought best, where it would be relieved by springs and thereby do away with the extra dead weight in the drivers, which it would seem produces a greater wear on the tire, and is more injurious to the track than the same or even greater weight would be when transferred to the engine, where it would be relieved by springs.

In the article referred to in the beginning, I notice the writer says a significant feature of the newly discovered data regarding the wear of locomotive tires, then, is that they wear with extraordinary rapidity at the part where the power is least likely to cause wear by slipping. Now, it seems, and it has always so seemed to me, that the first half-inch at least of a four-inch tire ought to possess nearly as good wearing qualities as the same amount of metal in a three-inch tire. On account of mechanical defects in rolling, the tire would naturally be less dense, so to speak, as it wears away toward the center, and, consequently would wear faster than at the outside. That idea and the objection to the extra weight have kept me from using four-inch tires, but these later developments would seem to show that there is nothing certain regarding this conclusion. I may perhaps have presented my ideas rather incoherently, certainly somewhat disconnectedly, but if it be the means of promoting investigation in this direction, I shall have reached the result intended."

THE New York, Lake Erie & Western have put in service ten new express refrigerator cars, designed to run in passenger trains. They are 50 feet long over bodies, have passenger trucks, and are divided into three compartments, the center one being used for express matter, and the two end ones for refrigerator freight.

Engineering and Shop Notes.

During a recent visit to the Union Pacific Shops, at Omaha, I found the mechanical department exceedingly busy with repairs of locomotives and cars. The road is doing a heavy business, car loads keep increasing in weight, and the last car each one can pull is put on the locomotives, so all that means much repairs. The company are not so well provided with the means of doing repairs economically as they ought to be. In the early period of the road's history there was no lack of money, and there was the best opportunity in the world to erect shops that would accord with the prospects of the corporation. But, instead of doing this, the officers then in charge built as if about 100 locomotives and 5,000 cars would be the limit of the company's rolling stock for half a century. And up to the last day that the past management were in power, they built rolling stock as if the interchangeable system had not become known west of the Missouri. The consequence is, that the company have shops inadequate for the work to be done, shops built without an intelligent plan, and extended where a wing could be put up at least present expense, and their old locomotives and cars, owing to want of uniformity, have to reach the shop before the material to repair them can be prepared.

The present management are laboring hard to reduce the machinery to recognized standards, and the shops have been made as convenient as circumstances would admit. It is expected that in the near future entirely new locomotive repair shops will be built at Omaha, and some of the other important points. If the other shops are like those at Omaha, an entirely new equipment of tools will be needed for each of them.

DRAWING FOLIOS OF STANDARD DIMENSIONS.

In the reorganization of the mechanical department, which is quietly in progress, the drawing office is performing an important part by preparing drawings of the standards, and the details of the same for the use of master mechanics and master car-builders in the various shops. Mr. John Wilson, the able assistant superintendent of motive power, takes personal supervision over this important work, and he is carrying it out in a most systematic and comprehensive manner, with the cordial co-operation of Mr. Hackney, superintendent of motive power. They follow a plan of arranging their standards in blue print folios, which are sent to the various mechanical headquarters. For instance, drawings of all kinds of standard springs used by the company are put into one folio. When a master mechanic or car-builder wishes to order a spring, he turns to the folio and finds the letter and number of the spring he wants. If the size or form he wants is not in the folio it is not standard, and he must use a standard form if he can do so, but if not, an explanation of why he cannot use the standard must accompany the order for the outré spring. Spring saddles, axle boxes, all kinds of brasses, eccentrics and their straps, cross-heads, pistons, cylinder heads, and in fact all leading parts about locomotives and cars are folioed and subjected to the same rules of ordering as those adopted for springs. The system is by no means complete, but work on perfecting it is going on rapidly, and as soon as one portion is finished it is put in practice if it can be done conveniently. The time I was round, they were working on pilots and their attachments. Like the locomotives on many other roads, each old engine on the Union Pacific was a law unto itself as to the height of pilot and the size of its braces. When a pilot got damaged a new one had to be fitted on. Mr. Wilson and his assistants have managed to reduce the whole of the pilots belonging to the road to four standards, and the same push bar fits all of them.

ADVANTAGE OF AN INTERCHANGEABLE SYSTEM.

When this system of standards gets properly introduced, it will effect an enormous saving of expense for labor and material, besides reducing materially the time needed to do repairs. With good tools and a proper system of production at some convenient point they can manufacture cheaply the greater part of the pieces used in repairs and send them to out stations as they are ordered, where they can be put on with little or no fitting. The interest on the reduced quantity of stock that has to be carried under the interchangeable system, will soon pay the expense of putting it into practice.

DRAFT REGULATING APPLIANCES.

They are putting the extension front, high exhaust pipe and single exhaust nozzle on all engines that come into the shop for repairs. In the long stretch of territory traversed by the Union Pacific Railroad quite a variety of coal is found, and the company use in all cases the local coal if it is good for steaming purposes. The mechanical department have found that the coal found in the various districts needs treatment peculiar to itself. Not only has the coal in one district to be fired in a different way from that in the next region, but the draft appliances in the front end must be adjusted to suit the particular coal the engine is using. The engines on the Eastern divisions use Iowa coal, but if one of them gets moved west where mountain coal is used, the front end has to be manipulated before a mile is run, or the engine will throw fire.

These may suggest an explanation of why the extension front is a good spark arresting device on some roads, and the worst kind of a failure for that purpose on other roads.

SULPHUROUS COAL HARD ON COPPER FIRE-BOXES.

Owing to the excessively bad feed water used perforce on some divisions of the Union Pacific, quite a number of copper fire-boxes have been put in their locomotives. These did very well with mountain coal, but since they began using Iowa coal, the copper fire-boxes have corroded very rapidly. The Iowa coal contains large quantities of sulphur, which combines with the fire side of the copper sheet and soon ruins it.

DEPARTMENT OF TESTS.

Following the lead of other first-class roads, the Union Pacific management have established a laboratory for making chemical and physical tests of the material purchased for the use of the company. The laboratory occupies a new building near the store rooms, and the testing machines are in a part of the storehouse arranged for the purpose. This department is under the supervision of Mr. J. J. Burns, general storekeeper. The machinery for physical tests was not in working order when I was there, but they had got in a gas engine to provide the power and a portion of the apparatus was ready for work.

The laboratory, which is well provided with the most approved appliances for making chemical tests, was in working order, and the chemist was engaged in the important business of analyzing the water for boiler use. The dry season has made the water question a pressing one upon the Union Pacific, and a systematic endeavor is being made to select the feed water. The most troublesome impurity that this road has to contend with is the so-called alkali water, which causes violent foaming in the boilers and corrodes the sheets. The chemist has got out the following circular directing how water intended for analysis shall be sent from out stations:

1. Use only new jugs, glazed inside and out, and fresh, sound corks.

2. Rinse out jug several times with the water to be sampled, which is to be taken as a rule from the tank.

3. Take the sample as far from the sides and top of the reservoir as possible, and avoid stirring up the sediment on the bottom.

4. If the water is to be taken from a pump or faucet, draw off a few gallons to thoroughly clear the pipes before taking the sample.

5. Fill the jug almost full and cork tightly, tying and sealing in such a way as to prevent the sample being tampered with.

6. Attach to the jug handle a tag, "Chemical Laboratory, Omaha Shops." On back of the tag give date on which sample was taken, with name of water station and state whether taken from a tank, well or from some natural source.

LUXURIOUS EMIGRANT SLEEPING CARS.

In the car shops, which are rather more convenient than the machine shops, Mr. A. M. Collet, master car-builder, is busy mostly with repairs and changes on cars that have been in service. He is rebuilding all the emigrant sleeping cars belonging to the road, and adding conveniences that will make these cars very comfortable to travel in. The berths will be curtained, and the various fittings of the cars will be the same as those put into first-class coaches. There will also be a combination cooking stove in each, a sink for dish washing, separate toilet rooms for men and women and a tank in the upper deck for maintaining a supply of water. The car department keeps putting on the Westinghouse air brake equipment at the rate of about ten a day.

Accompanied by Mr. Hackney, I made calls at the general offices of the company, on Mr. S. R. Callaway, general manager, Mr. S. T. Smith, general superintendent, and Mr. J. J. Burns, general storekeeper. They all had kind words for the CAR-BUILDER and its representative.

INGENIOUS ARRANGEMENT OF CHARTS.

In Mr. Smith's office I examined an admirably devised arrangement of time-table charts. In a recess let into the wall at the end of the room, seven or eight charts, one for the details of each division, are hung and raised or lowered by means of sash weights. The normal position of the charts is to be down out of sight. When Mr. Smith wants to consult any particular chart it is raised. A large chart worked on the same plan is kept for the general plan of trains.

LIBRARIES AND READING ROOMS.

I was much interested in the particulars given me by the officers, of various schemes that are in course of development for the benefit of the employés. The first of these in my esteem is the Union Pacific Employés Library Association. According to the printed constitution, "The object of this Association is to be mutual improvement, spreading of information and useful knowledge by the establishment of a library and reading room, delivery of lectures, instruction to classes, etc." The intention is to establish associations of this character at all important points on the line of road. To fully appreciate the advantages likely to accrue to the employés of a company like the Union Pacific from a well organized scheme of this kind, one must understand the surroundings of the division points where the men have to spend their leisure time. The association is going to give the men pleasant human companionship and elevating pastimes in many regions where dreary solitude and depressing desolation are nature's surroundings.

I received from the general secretary the catalogue of an association established at Como, Col. It contains between 500 and 600 excellently selected books. About one-tenth of the books are kept in the library for reference; the others are circulating. Each member is required to pay 50 cents quarterly for use of library and reading-room. The association is managed by a board consisting of chairman, secretary, treasurer, and five directors to be chosen, one from the motive power and car department, one from the engineers and firemen, one from the maintenance of way department, and two from the transportation department, all of whom are elected annually by the members of the association. The first 600 books are contributed by the company, and they furnish rooms, light and heat for each association.

APPRENTICESHIP SYSTEM.

The company are about to introduce an apprenticeship system into their shops similar to that used by the Baltimore & Ohio Railroad and several other Eastern corporations that take a a practical interest in the welfare of their employés. The boys to be employed as apprentices will be examined medically, and they will have to pass an examination to show that they have received the elements of a good English education. On passing these, the boys selected will be required to agree to serve an apprenticeship of four years. While going through the four years' course they will be under an inspector, who will see that they get fair treatment and are permitted to learn all departments of the business.

CENTRAL IOWA SHOPS AT MARSHALLTOWN.

Mr. John Player, master mechanic of this road, like nearly all other master mechanics in Iowa, is wrestling with boiler troubles caused by the unusually hard water that has been used this season. His company have been hauling water with tanks placed on flat cars for the last three months, and no kind of well was regarded as too hard for supplying boilers. None of their fire-boxes have been scale-burned yet, but it has taken ample use of the washing hose and rods to keep the boilers fairly clean. The policy followed has been to prevent saturation within the boilers of the scale-forming compounds. Mr. Player has been using a scale-preventing mixture, which appears to work well.

They are very hard up for motive power, the road doing an unusually heavy business, but they manage to get along and keep the engines in good shape, although the help is closely curtailed and the tools limited. They appear to have found out all methods ever devised of doing good work with tools intended for other operations. They have an ingenious way of planing the inside of driving boxes. Having no slotter to do that work, they arranged a special tool on a shaping machine, which planes the box to a true circle. A round bar having a gear fastened to it is secured to the slide of the shaping machine. This bar is made to work in a guide about the middle of its length, and at the extreme end is a slot for holding a planing tool. A small table is secured below the tool, and the axle box rests on the table. The bar is turned by a ratchet working on the gear. The bar is made to revolve just at the speed the tool is cutting the axle box. The rig was got up by a machinist named Higgins.

When I was at these shops before, Mr. Player had just applied a self-dumping ash-pan of his own design to one of his engines. He watched the performance of the engine very closely for several months, and was forced to the conclusion that an ash-pan of that character leads to waste of heat, so he secured the slats as nearly air-tight as possible, and is running the pan that way. He is running some of the engines with an open stack and high exhaust pipe without any extension, and reports that they work well. He uses a diaphragm perforated along the upper portion with ⅜ inch holes.

The company have five of the famous Mason Fairlie double track locomotives that they might be induced to part with on easy terms. The engines have all the latest improvements of that type—plenty of adhesion and no want of cylinder power and steam generating capacity, Wolschaert valve motion, a big whistle and a generous sounding bell, yet the company would fain part company with these unique locomotives.

ST. PAUL & DULUTH.

During a visit to St. Paul, I paid a visit to Mr. Chas. F. Ward, master mechanic of the St. Paul & Duluth, and found another man struggling to do work without any facilities. The road has work that keeps fifty locomotives busy, yet the machine shop is a wooden shanty, where it is hard to crowd in two engines. The inconvenience that this condition of affairs entails will soon be ended, for the company are going to erect fine new shops in the spring. Mr. Ward is a vigorous, clear-headed young man, who makes the best of the limited facilities at his command. He is using the Hickey extension front and cinder hopper on some of his engines, having taken particulars of the device from the illustrations published in the NATIONAL CAR AND LOCOMOTIVE BUILDER. He speaks very highly of the way the appliance works.

MINNEAPOLIS & NORTHWESTERN.

I found Mr. W. Heintzelman, master mechanic of this road, with his headquarters in a small roundhouse. The

company have got the buildings of the new shops erected, but the tools are not in yet. Most of the rolling stock belonging to the road is nearly new, and they have started out with extremely well designed machinery. An 8-wheel passenger engine which I examined and which is a fair representative of the others, has 18 × 24 inch cylinders, a large boiler with 270 flues, and about 1,500 square feet of heating surface.

RAILROAD BUSINESS IN ST. PAUL.

During the time I remained in this city, I was very much struck with the active state of railroad business. All the roads appear to have more traffic than they can handle, and in every office the leading topic of conversation invariably was how the increasing business was to be handled. All the roads appear to be short of rolling stock. A great many new locomotives and cars have been contracted for and other new contracts are talked of, but the uniform complaint is that delivery is too protracted.

There are a great many railroad extension schemes talked of in this region. The construction is being pushed in some quarters regardless of the obstacles presented by the severe winter. Track laying was in progress on one line with the thermometer below zero.

In the course of a chat with a leading railroad engineer, I learned that some of the Northwestern roads have been suffering badly from splice-bars breaking. Cars were never loaded so heavy as they are now, and they were never run so fast, and the rail joint comes in for unusually hard blows. The common fish-bar has proved itself badly wanting in the element of strength. This engineer was imbued with a strong belief in the merits of the Samson splice-bar, and made the assertion that while the common bars were breaking daily in large numbers, he had never seen a Samson bar broken unless through derailment or some cause that was out of ordinary usage.

A. S.

New England Railroad Club.

The regular monthly meeting of this Club was held on Wednesday evening, Dec. 8, President Marden in the chair. There were 65 members present

DISCUSSION OF THE INTERCHANGE RULES.

The President called attention to two points in the rules which had been under discussion at the afternoon meeting, one of which was the repair of cars with raw material, and the other was in regard to the making out of bills for repairs at rates different from those prescribed in the rules.

Mr. Lauder—I am very glad that Mr. Clark and others have taken the stand they have in regard to appliances for the safety of trainmen. It shows that the position taken by quite a number of roads here in the East is entirely right in this matter. I feel sure that if it were properly brought before the different clubs and discussed, we could arrive at an understanding that would result in our cars being put into a satisfactory condition.

Mr. Fletcher—The National Dispatch Co. has had a great deal of trouble from the use of wrong material. We have had good new cars come back repaired with wrong material—oil boxes too small put in, draw-bars two or three inches too short, or so; small as to render the car unsafe to run, and various things of that kind; but it is impossible to locate them, and this is a sore evil. We have collected perhaps a cord of foreign draw-bars that we have taken out in this way, and it is a heavy burden. It is all wrong.

Mr. Adams—This matter is provided for in the rules, and there would be no trouble in tracing these things if people were honest with each other. We have sometimes had trouble, on getting cars home, where wrong material has been put in; that is, material not in accordance with the rules, not like what the car originally had in, and we could not ascertain where it was done. If the person making the repairs, if he puts in any wrong material, would attach a card to the car, as required by the rules, there would be no difficulty. That is done invariably on our road; and where it is not done it shows either an ignorance of the rules or a disposition to be dishonest.

I am glad to see that the western roads are waking up to this matter of the safety of trainmen. The eastern roads have done considerable in that direction, and it would be for the interest of all the roads if they would follow suit. And if all the roads would insist upon their cars being in first-class running order it would facilitate the movement of freight more than anything else that could be done. I have been told of cars just built, where the different wheels varied over an inch. With regard to spiked ladders, a prominent car building corporation have turned out thousands of cars where the spikes were driven in perhaps not half an inch into hard wood. You could pull them out with your hand. I wrote to them and told them they were guilty of manslaughter, but never got any reply. As long as such things are allowed to continue our trainmen will be in danger.

Mr. Fletcher—We have tried always to be very particular about our ladders and running boards; and we have been subjected to much expense and delay on account of ladders being bent in, so they have broken the sheathing, caused by a car backing up against the bulkhead and bending the ladder rounds in. If a trainman attempts to get to the top of a car in that condition he may endanger his life.

The President—I don't think this matter of repairs of cars can be talked about too much. If we could get out more on to other roads in different parts of the country, and induce the western people and the southern people to come here and look at the working of our roads, and if people in different parts of the country would meet and talk these matters over, we should find that we are not so far apart after all. It is a good sign that the western roads are taking up this matter, and presently it will be seen that the eastern roads are not, as has been asserted, too strict in the matter of inspection.

STANDARD SIZE OF WHEEL CENTERS FOR STEEL-TIRED CAR AND ENGINE TRUCK WHEELS.

Mr. Lauder—Steel-tired wheels have come into such general use within a few years that we ought to adopt some definite standard for the makers to conform to. I think that the size of the wheel center should be established, and not the diameter of the outside of the tire when new, because some will want 2-in. tires, some $2\frac{1}{2}$-in., and some 3-in.; and if you make the outside diameter the standard, the wheel centers must vary according to the different thicknesses of the tires required. Again, chilled wheels reduce very little in diameter by wear, while steel-tired wheels are capable of being reduced perhaps 3 in. in diameter before they are worn out. Take a 33-in. wheel, which has been the standard size of car-wheel from time immemorial, with a $2\frac{1}{2}$-in. tire on it; that tire will run down to an inch thick; that means a reduction in the diameter of the wheel of 3 in., so at last you are running a 30-in. wheel, and that means more rapid revolutions, more friction, and more liability to heat. It seems to me a 33-in. wheel should be 33 in. mean diameter; that is, when it is half worn out; so that a wheel originally $34\frac{1}{2}$-in. in diameter, when half worn out will be 33 in. in diameter. If we start with a 28-in. wheel on an engine, it will be 26 when it is worn out. If a locomotive will take a 28-in. wheel, we can easily start with a 29 or $29\frac{1}{2}$-in. wheel in it, and when worn out will be down to 27. If we order a 36-in. car wheel, when worn out it will be down to 33. We have lost the benefit of the larger size, and it always seemed to me there was not difference enough between a 33-in. and a 36-in. wheel to warrant making the change. We have just ordered a 36-in. wheel for some parlor cars; that is, a 32-in. wheel with a 2-in. tire. When worn out it will be somewhat larger than 33 in. I believe in a 42-in. wheel; we have some running, and they work well. If we could have a 48-in. wheel I should like it; but we cannot get one larger than 42-in. under an ordinary car. I think if we should start with $29\frac{1}{2}$ in. wheels under our engines instead of 28, it would be more satisfactory. If there should be a uniform standard of wheel centers established it would be an advantage to the wheel makers.

Mr. Adams—I suppose one of the most desirable things is to get a uniform wheel for passenger service all over the country. 42-in., 36-in. and 33-in. wheels are quite commonly used now; perhaps other sizes are used. I think there has been more theory than fact in regard to the 42-in. wheel being so much better than any other wheel, about its doing so much more service, and carrying a car so much easier than a smaller wheel. My experience has been almost absolutely to the contrary. I doubt if any person traveling on a car could tell the difference. In crossing such a place as the Providence crossing down here, where there are five or six tracks and a good many frogs, in dropping into those openings there is a difference in favor of the larger wheel, and in going over a frog there may be a slight difference; but those differences are so slight, I don't think they are much of an argument in favor of the 42-in. wheel. It occurred to me that it might be possible to make the centers of our wheels alike; that is, one class of wheels; and for other classes it might be necessary to make a different sized center. The main object of getting a uniform center would be to enable the car makers to make up a large quantity of tires in advance and have them in stock; and centers might be made up in the same way; the difference would be in the thickness of the tires; the inside diameters would be the same. Is seems to me very desirable to get a uniform standard wheel for the passenger service of the country. There is a great advantage in a 36-in. wheel. Most roads that have used steel wheels have two kinds of trucks, one for 42-in. wheels and one for 33 in. A 36-in wheel will go into either of those trucks without any great change. If you could adopt a standard for wheels to go in without any material change, it would be quite economical. I am satisfied that the 42-in. wheel does not make mileage in proportion to its additional cost over the 33-in. wheel.

Mr. Snow—What the wheel makers would like would be to have the association decide on the size. We are making 33, $34\frac{1}{2}$, 36, $37\frac{1}{2}$ and 42-in. steel-tired wheels for passenger service, and a variation below that for tender wheels. We have been making tender wheels half an inch larger than the specification called for. When we began to make the steel-tired wheel for passenger service, our first patterns were made to correspond, a half inch larger than the size called for; but afterward, in order not to be different from other makers I arranged to make our wheels the size of theirs. It seems to me that we should take the outside diameter for the standard and not the inside, from the fact that wheels vary so much in construction. Some have no solid centers at all.

Mr. Coney—I agree with Mr. Snow. There are some steel-tired wheels that practically have no center. With the wheel that I represent we can make any kind of center up to 42 in. without any trouble. Some could not do that without considerable expense and trouble. If there were an established size for the outside of the wheel, we could always give the purchaser what he wanted.

Mr. Ellis—It seems to me that the matter of the inside diameter of tires is of importance to the tire maker, as affecting the making of tires for stock.

Vice-President Lauder—I still adhere to my view that the wheel center is the proper place to establish the size. I see no reason for any confusion, as regards the different wheels I am familiar with. The Allen paper wheel has a center that is forced into it: Mr. Snow's wheel has a center; the Paige wheel has substantially a center; the tire sets on two plates, and the outside diameter of those plates gives the diameter of the center. Every wheel with a loose tire set on the center has a center. Of course a center could not be established for wheels that have the tire welded on. I think there will be confusion if you attempt to establish the diameter of the outside of the wheel, because different people will require different thickness of tires. I think we should take the outside diameter of the wheel center as the standard for measurement. I agree with Mr. Adams that it is desirable to establish a standard passenger car wheel. I should prefer to have it as big as convenient to put under a car. I was struck with Mr. Adams' admission that there is a perceptible difference in passing over the Providence crossing, as regards the size of the wheels. Now a wheel will strike to the same extent into every joint on the road, and there is one every 30 feet; and I think this admission carries with it the idea that a 42-in. wheel gets over every joint easier than a 36-in. wheel does. I think a 42-in wheel will skip over these bad places.

Mr. Adams—I doubt the additional power.

The Chairman—I have no doubt the 42-inch wheel will haul the easiest. And I have yet to have the first case of a hot box where a 42-in. wheel has been used; while under similar cars, of the same weight, with 33-inch wheels, we have been troubled with hot boxes.

Mr. Marden—I never have been an advocate of the 42-in. wheel. My experience with them in cars coming to us is that they will flange wear quicker than a 33-in. wheel, and I don't think they will give the service that a 33-in. wheel will. I should be willing that a 33-in. wheel when half worn out should be adopted. I believe that a 42-in. wheel draws harder, especially up a grade; and as far as hot boxes are concerned I have not had much trouble with them with 33-in. wheels. I am not yet in favor of even a 36-in. wheel, but I do believe in fixing upon a standard size of wheel center.

Mr. Adams—I agree with Mr. Lauder that a 42-in. wheel is less liable to hot box than a 33-in wheel; but Mr. P. H. Dudley told me that a 42-in. wheel was not economical for us to use, in regard to power; that with a road as heavily graded as ours it would cost more money to run with 42-in. wheels than with 33-in. On a level track, he says there is three or four per cent. saving in power; but when you strike a grade you lose immediately, because you have to lift the additional weight over that grade, and it takes power to do it. I prefer a wheel larger than 33-in., but 42-in. I think is inconveniently large. When the tire of a 42-in. wheel gets too thin to be used with safety under a passenger train, you can't put it into a freight train; but if it was a 36-in. wheel, and worn down two or three inches, you could get from 50,000 to 100,000 miles wear out of it.

Mr. Raskills—I think the center should govern the size of the wheel, as that will govern the outside diameter, using the same thickness of tire. But if you adopt the outside diameter as the standard, you have got to carry a surplus weight of metal on some wheels. Increasing the size of the wheel will, of course, add a little to the cost, and also give greater weight.

Mr. Snow—In order to get this matter squarely before the club for discussion, I will move: That it be declared as the sense of this club that the following should be the standard diameters of wheel centers for steel tired wheels; for so-called 33-in. wheels, 30 in.; and for so-called 36-in. wheels, 33 inches.

Mr. Adams—I would like to ask Mr. Snow if he has in view a $2\frac{1}{2}$-in. tire.

Mr. Snow—Yes, sir.

Mr. Adams—Wouldn't it be cheaper to use a thicker tire?

Mr. Snow—The difference in the tire changes your brake leverage considerably. It has been conceded that a $2\frac{1}{2}$-in. tire was about as thick as was necessary. There are tires much less than that. A $34\frac{1}{2}$-in. wheel when half worn out, becomes 33 in., and your break leverage is adjusted to that.

Mr. Ellis—It is important to car builders to be able to make a comparison in prices of different wheels. Some makers sell a $34\frac{1}{2}$-in. wheel for the same price as a 33-in. wheel. They can't afford to do that; there is a difference in the cost. As regards the cost, I think the center of the wheel is far more important than the diameter.

Mr. Leach—It seems to me that the most important thing is to fix the standard thickness of the tire. That would be a standard for the outside and the inside too, and all would be pleased.

Mr. Prosser—It seems to me necessary to designate what constitutes the center of the wheel; there is quite a difference of opinion about that. I have considered the center to be the shrink place; some say it is the outside of the plate.

Mr. Coney—If you adopt a certain center, some wheel-makers can't make it. A uniform thickness of tire would be better for us all; $\frac{1}{4}$-in. thickness of tire means $5 difference.

Mr. Prosser—I think the 42-in. wheel is to be the wheel of the future, both for freight and passenger service. On the other side of the water no wheel is used less than 40 in. under any kind of equipment.

Mr. Snow's motion was adopted.

The Chairman—It is a question still unsettled by the different roads as to what is the best thickness of tire. A good many roads have been using tires four inches thick for locomotive driving wheels of late years. At the last meeting of the Club in Chicago, some figures were presented, showing much more wear of 4-in. tires than of 3-in., in engines of the same class, doing the same kind of work. And on two engines, just alike, in the same service, that with the 3-in. tire came within 2,000 miles of the one with the 4-in. tire before wearing out. You can't get a 4-in. tire so uniform and well compressed as one of 3-in. We are not yet prepared to vote on the thickness of tire, because we don't know what is the best thickness. We shall have to experiment more first.

Mr. Coleman—I will mention a little fact that came to my notice the other day. A workman in a factory where hydraulic pressure is used, put his chisel under the press, and applied the whole force of the pressure; and on taking it out and using it, found its efficiency immensely increased, so much so that it has been used for months without touching, in work where ordinary tools dull almost immediately. Now if this process could be applied to steel tires in their manufacture, we should see results that have not been seen with any tires hitherto made.

The committee appointed for that purpose reported a series of resolutions upon the death of Leander Garey, which are given elsewhere.

Mr. Richards—I move that the diameter of center for all carrying wheels be 3 in. less than the nominal diameter of the wheel, with the exception of 42-in. wheel. The idea is to have the wheel its nominal size when the tire is half worn out.

Mr. Ellis—That figuring makes the tire $\frac{3}{4}$ in. thick when it is worn out.

Mr. Adams—Would you run a steel tire down to $\frac{3}{4}$ of an inch in thickness under anything?

The Chairman—I should not. What Mr. Snow means is that the mean diameter of the wheel of 30-in. center should be 33 in.

Mr. Prosser—Why do you omit the 42-in. wheel?

Mr. Richards—It is difficult to get a 42-in. wheel under a car and make a good job. There is not room. If you use it, make it 42 in. on the outside when new. If $2\frac{1}{2}$-in. tire is used, make the center $37\frac{1}{2}$ in.

The Chairman—I should prefer 40-in.; it is difficult to get a 42-in. wheel under the trucks, and get the car down so that it will couple with other cars.

Mr. Ellis—I move an amendment to Mr. Richards' motion, that the center of the 42-in. wheel be 36 in.

Mr. Richards—I accept the amendment.

The Chairman—The motion as it now stands is: That the diameter of wheel centers shall be 23 in. for 26-in. wheels, 25 in. for 28 in. wheels, 27 in. for 30-in. wheels, 30 in. for 33-in. wheels, 33 in. for 36-in. wheels and 36 in. for 42-in. wheels; and that it is the sense of this Club that those sizes shall be adopted for steel-tired wheels for passenger and freight use.

Mr. Prosser—This question of where the center ends and commences ought to be decided. I ask Mr. Richards if he considers the center of the shrink place the center, the point where the tire is shrunk on to the center?

Mr. Richards—In paper wheels I should call it the bore; in the Paige wheel I should call it the plate; in the wheel with the Mansel retaining ring, I should call it the broad bearing on which the tire rests.

Mr. Kells—I think it is important to decide where the thickness of the tire is to be measured. If it is to be measured over the rail head, on a Paige wheel the tire would be 4 in. thick, and on the Prosser wheel 3 in. thick.

The Chairman—I think that is an imaginary difficulty. There can be only one inside center; the diameter of that is the diameter that comes in contact with the center.

The motion as amended was passed.

It was voted to consider at the January meeting the best methods of heating and lighting cars in passenger service. The meeting then adjourned to the second Wednesday in January (Jan. 12).

LEANDER GAREY.

The committee appointed for that purpose reported a series of resolutions upon the death of Leander Garey, which were adopted by the club:

WHEREAS, this club has learned with the sincerest regret of the death of their late lamented friend, Mr. Leander Garey, who was among the oldest and most honored of its associates, and to whose zeal and perseverance the formation and success of the Master Car-Builders' Association is largely due; who was for many years the leader in all of the improvements that were submitted to the action of that body; and

WHEREAS, we honored him not only as a man and a useful member of the car builders' associations, but because, in addition, he gained our affections by the uprightness with which he carried himself under all circumstances, and his uniform kindness toward all who were brought in contact with him, and the assistance that he was always more than ready to give to those who came to him for guidance and advice, therefore be it

Resolved, That this club and the railroad fraternity have lost a valued friend and one whose influence will long be felt, and that we hereby present to the bereaved family and friends our heartfelt sympathy in their affliction, and assure them that their grief will be our own, and

Resolved, That the secretary be instructed to spread these resolutions upon the minutes of the meeting, and have a copy engrossed and sent to the bereaved family.

J. W. MARDEN,
F. D. ADAMS,
J. T. LEIGHTON,
Committee.

MR. JAMES N. LAUDER, Superintendent of Rolling Stock of the Old Colony Railroad, has built during the past year four new locomotives in the company's shops at Boston. They were all eight-wheel passenger engines. His new 18×24 inch engines are doing excellent work pulling the heavy fast passenger trains on the road. They are running the heavy, fast steamboat train with a consumption of little over 30 pounds of coal per train mile. These engines have the branched arrangement of exhaust pipe designed by Mr. Lauder, carry 175 pounds of steam on the boilers, and have 1,448 square feet of heating surface. We still hear, occasionally, master mechanics declaring that increase of flue-heating surface is of little value to locomotives, just as we still hear the senseless belief expressed that small steam passages are an advantage; but the locomotives that make their mark for doing work economically have ample heating surface and ports that will admit and exhaust steam without restriction. On the other hand, the locomotives that are notorious as coal wasters have small flue area, and the engines that do the least amount of work for their inches are those with short ports.

Information from Indicators.

BY ANGUS SINCLAIR.

EXPERIMENT WITH EXHAUST NOZZLES.

There is no difficulty in demonstrating theoretically that a single exhaust nozzle will produce a higher smoke-box vacuum than double nozzles with the same steam velocity, yet it is an incontrovertible fact that a single low nozzle has never been successfully used. When the exhaust opening is placed low down in the smoke-box, the exhaust pipes must be brought together so abruptly that steam from one side will always tend to shoot over into the opposite exhaust pipe, causing so much back pressure in the cylinders that the arrangement cannot be used economically. Attempts to use a low single nozzle have been made so often, and have so uniformly failed, that many railroad engineers have received the impression that, while theoretically correct, the economical use of a single exhaust opening was impracticable, and this sentiment has extended in a great measure to all forms and positions of single nozzles.

THE SINGLE NOZZLE.

The single exhaust nozzle is receiving increased patronage every month among the most intelligent and progressive master mechanics in the country, but it is now almost invariably applied to locomotives having a high exhaust pipe. The men who recognize the value as an economical means of promoting combustion of passing the exhaust steam straight through the center of the smoke-stack, also, as a rule, understand that they must not obstruct the piston with back pressure in their zeal to obtain central steam exhaust, so they use exhaust pipes constructed in such a shape that the steam will have no tendency to pass downward. There are cases on record where master mechanics have abandoned the single nozzle with high exhaust pipes after a trial, but there is reason to believe that bad forms and maladjustment of attachments prevented the arrangement from working to the best advantage. There are often influences surrounding a road that prevent improvements from being tried on their merits. Ignorance and prejudice have condemned many meritorious appliances, the trial being a farce played against foregone conclusisns.

EXTENSION FRONTS AND SINGLE NOZZLES ON THE CHICAGO & NORTHWESTERN RAILWAY.

For some time back Mr. G. W. Tilton, superintendent of motive power of the Chicago & Northwestern Railway, has been applying the extension front, high exhaust pipe and single nozzle to all the locomotives belonging to the road as they went into the shop for repairs. The engines have made an excellent record with the changed draft appliances, but among some of the enginemen there was a decided sentiment of opposition to the single nozzle. The average intelligent engineer will do all in his power to give any improvement placed upon the locomotive a fair opportunity of showing what it is worth, but there are others so case-hardended by conservative notions that they cannot treat an innovation justly. The opposition to the single nozzle took a curious turn among some of the Chicago & Northwestern engineers. I was repeatedly assured that it had spoiled some good engines, and the men opposed to it said they could see the steam blowing from one cylinder to the other when they had the cylinder cocks open. It was useless to tell them that they were mistaken. They were impressed with the conviction that the steam acted in that way and nothing would convince them to the contrary.

TESTING WITH THE INDICATOR THE EFFECT OF SINGLE AND DOUBLE NOZZLES.

At this time, when the prejudice against the single exhaust nozzle was still prevalent, Mr. Tilton requested the writer to apply the indicator to two of the engines, Nos. 50 and 122. These engines were employed in the same kind of service, pulling suburban passenger trains, and they were alike in every particular except that No. 50 had a single exhaust nozzle 4 inches diameter, and No. 122 had double nozzles $2\frac{5}{8}$ inches diameter. Both engines had extension fronts and high exhaust pipe, the combination illustrated in the NATIONAL CAR AND LOCOMOTIVE BUILDER, issue of June last. The cylinders are 16 × 24 inches, wheels 63 inches diameter. There are 963 square feet of heating surface in the boiler, and the grate area is $16\frac{1}{8}$ square feet.

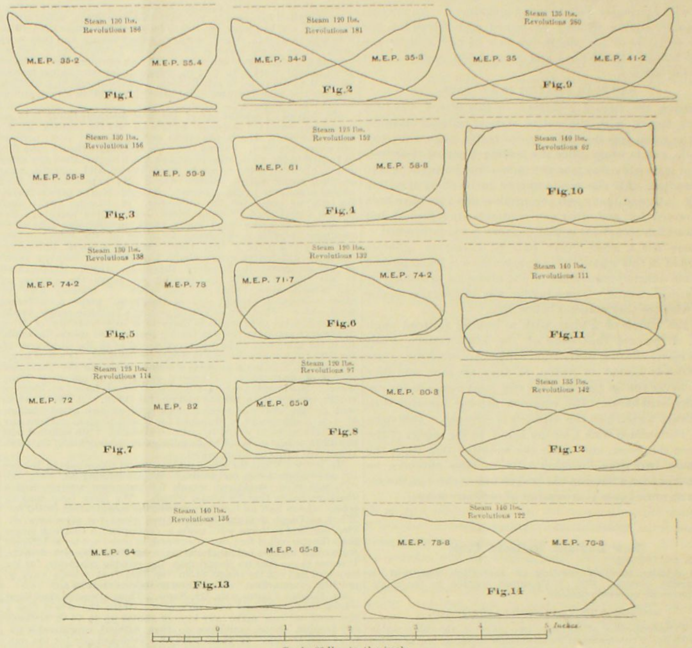
REAL AND MARKED POINTS OF CUT-OFF.

The quadrants are notched and marked in the usual way, but the real cut-off is in every instance but one different from that given on the quadrant. The following are the marked and real points of cut-off:

Engine 50. Quadrant.	Cuts off at.	Engine 122. Quadrant.	Cuts off at
6	$7\frac{1}{2}$	6	$7\frac{1}{8}$
9	$10\frac{1}{4}$	9	$9\frac{1}{2}$
12	$12\frac{3}{4}$	12	$12\frac{1}{2}$
14	$14\frac{1}{2}$	15	$15\frac{1}{4}$
16	$16\frac{1}{4}$	....	....
18	$17\frac{3}{4}$	18	18
20	$19\frac{1}{2}$	20	$19\frac{3}{4}$
22	$21\frac{1}{2}$	22	$21\frac{1}{2}$

EVIDENCE OF THE INDICATOR DIAGRAMS.

Assisted by Mr. E. B. Thompson, chief draftsmen of the Chicago & Northwestern Railway, I made several trips on the engines, taking indicator diagrams and watching their action in pulling trains. The cards were taken in the ordinary working of the engines, the engineers being directed to act as if no experiments were going on. The engines were handled very well, and steam was regulated to a great extent by the links. A Tabor indicator with 80 pound spring was used. The diagrams shown in figures 1, 3, 5 and 7, were taken from engine No. 50 with the single nozzle, and figures 2, 4, 6 and 8 were taken from engine No. 122 with the double nozzles. The diagrams were selected to match as nearly as possible. A great many diagrams were taken, but the few shown give a very fair estimate of the work done by the engines and the kind of cards that each produced under similar conditions of work. There were no indications shown of the steam passing from one cylinder to the other where the single nozzle was employed, and that engine produced less back pressure than the other one throughout all the tests. The leading difference between the two engines was that the exhaust steam line of the single nozzle engine generally dropped nearly to the atmospheric line before the return stroke commenced, while with the double nozzle engine the exhaust line showed indication of restricted release. The difference was not material, however, but it was enough to give evidence that were both engines worked up to a high speed with as heavy a train as could be handled, engine No. 50 would have a decided advantage over the



Scale 80 lbs. to the inch

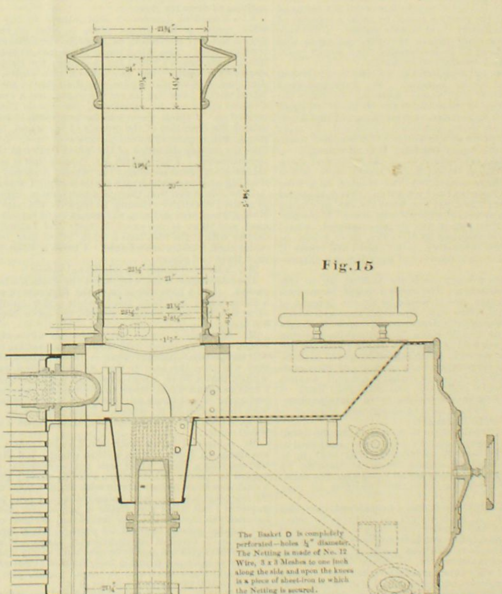


Fig.15

other. It also proved that the inferior action due to the single nozzle was entirely imaginary.

LOCOMOTIVES HAVING "SNAP."

Most engineers like to hear their engines work with what they call "snap," and in this respect No. 50 was the inferior. Snap, according to railroad vocabulary, means a sharp sound to the exhaust. The men who are fond of hearing their engines snapping with the exhaust steam, do not realize that increase of noise means increase of work done by the steam against the atmosphere.

A HIGH SPEED DIAGRAM.

As the speed at which the diagrams were taken was in every instance low for passenger service, it may be inferred that the tests were of little value in testifying respecting the efficiency of the single exhaust nozzle as affording a relief from back pressure in the cylinders. Fig. 9, however, gives evidence that a single exhaust cavity at the end of a properly designed exhaust pipe will relieve the cylinders when the piston speed is high. That diagram was taken by the writer from a locomotive equipped with Mr. William Wilson's motion for operating single valves when the engine was pulling a fast express train on the Chicago, Alton & St. Louis Railroad, when running at a speed slightly over 54 miles an hour. There was a sufficient volume of steam entering the cylinders to keep a train of eight heavy passenger cars going at the speed mentioned on a level track, yet there was less back pressure in the cylinders than any thing I have seen taken under like conditions. The engine had cylinders 17 × 24, driving wheels 66 inches diameter outside of tires and a high exhaust pipe with single nozzle 4½ inches in diameter. All the diagrams taken during the trip were remarkable for their absence of back pressure, and some of them were taken when the engine was working hard at 12 and 15 inches cut-off, forcing the train into speed after getting away from the stopping places. It will be noticed that the engine was making 280 revolutions per minute when the diagram of Fig. 9 was taken, which was equivalent to a piston speed of 1,120 feet per minute.

EFFECT OF A BAD FORM OF EXHAUST PIPE.

As has been mentioned, the efficency of the single nozzle depends to a great extent upon the form of the exhaust pipe. Figures 10 and 11 were taken from an engine with an exhaust pipe of medium height and of a defective design. Plain indications of the steam from one cylinder obstructing the flow of steam from the other side are visible in both the diagrams.

EFFECT OF A CHANGE.

The improved action of the steam that results from altering a defective exhaust pipe is forcibly illustrated by Figs. 13 and 14. They are diagrams that were referred to by Mr. Charles Blackwell at the last master mechanics' convention as having been taken under his direction from a consolidation engine on the Norfolk & Roanoke Railroad. No. 13 was taken from the first form of single nozzle tried, and was found to create injurious back pressure. Fig. 14 was taken from an improved form of pipe and its use greatly exhausted the efficiency of the engine. In this case a medium height of exhaust pipe is used, as shown in Fig. 15, and a basket arrangement made from perforated sheet iron intervenes between the nozzle and the stack base performing the functions usually done by a short petticoat pipe where the exhaust opening is so far from the base of the stack. In this exhaust pipe the pipes from both cylinders join where the joint can be seen in the pipe. At that point the opening of each of the pipes is nearly the same as the opening of the exhaust nozzle. Mr. Blackwell thinks this arrangement is essential as a means of preventing back pressure in an engine using this comparatively short exhaust pipe with single nozzle.

THE CROMWELL EXTENSION FRONT.

The extension front and draft-regulating arrangement shown in Fig. 15, which produced the most satisfactory results in the tests made by Mr. Blackwell, was patented by Mr. A. J. Cromwell, of the Baltimore & Ohio Railroad, and is used extensively on that road with entire success. The combination is reputed to give perfect satisfaction with the coal burned East and South, but I have seen a similar arrangement tried in the West, where it was abandoned on account of the back pressure induced in the cylinders. That, however, may have resulted from a bad form of pipe, and would have probably acted differently had the same means of improving it been used that were followed by Mr. Blackwell.

ADVANTAGE OF CUTTING OFF STEAM EARLY.

The indicator diagrams shown in Fig. 7 might convey a valuable lesson of economy to engineers. The card to the right looking at the figure, and which may be called No. 1, was taken when the engineer was working the engine in the 12-inch notch and throttling the steam. Before the second card could be taken he hooked up the engine to the 9-inch notch, and opened the throttle wide. (The real points of cut off were 12½ and 10¼ inches.) Although the steam was admitted to the piston 24 per cent. less distance after the engine was hooked up, the reduction in the mean effective pressure was only 10 pounds per square inch. The steam in card No. 1 was, owing to the short period of expansion, released at comparatively high pressure, so that 28.6 pounds of steam was used per indicated horse-power per hour. In card 2, with the longer time for expansion, the work was done with an expenditure of 25 pounds of steam per horse-power per hour. In both cases a large volume of steam is used in doing the work. Card No. 1 indicates 455 horse-power. The engine worked in that way for one hour would use up about 13,013 pounds of steam. Card No. 2 indicates 411 horse-power, and the engine worked in that way for an hour would use up 10,275 pounds of steam. The steam is evaporated from water, of course. Western coal evaporates about 5 to 1 from tank temperature. So card No. 1 would call for 2,602 pounds of coal per hour, and card No. 2 would use up the steam generated by 2,055 pounds of coal. The increase of power in No. 1 over No. 2 is about 11 per cent., and this is done with 26 per cent. increase of steam. But the extra steam used in the cylinders does not sum all the loss due to the late cut-off. The heavy volume of steam passing through the smoke-stack intensifies the draft so much that the fire is torn up and stimulated to a much greater extent than with the early cut-off, and a larger proportion of the heat is passed into the atmosphere.

A LOGY ENGINE.

The diagrams in Fig. 12 I took from a locomotive that was reputed to be very logy and wasteful of coal. The engine had low double nozzles, ⅛ inch lap, and when working appeared to exhaust square, but the indicator proved that the valves were badly set. The greatest trouble, however, was in viciously contracted nozzles and restricted passages through the saddle. When the valves were squared, the exhaust nozzles opened ⅛ inch and $\frac{1}{16}$ inside lap cut out of the valves, the engine was greatly improved and did the same work with 20 per cent. reduction in coal.

APPLY THE STEAM ENGINE INDICATOR.

The railroad with more than twenty locomotives that does not own an indicator and use it frequently, is neglecting an important source of saving. There is no difficulty in acquiring the skill needed to apply the indicator and to read its teachings. The Tabor indicator used in taking most of the diagrams shown never gets out of order; it can be handled by any intelligent mechanic as easily as an air pump or injector is operated. Nothing would pay better than keeping an instrument of this kind constantly in use. All traveling engineers ought to be required to apply the indicator to engines that are not working properly. Where the indicator is applied to locomotives, it is too often used as a sort of scientific plaything, or to show how perfectly the steam is distributed in the cylinders of some crack engine. These are not the kind of engines that need the use of an indicator, unless it may be in the interest of some line of investigation. The indicator is the stethoscope of the mechanical physician, and it is written "he that is well needeth not a physician, but he that is sick." It is the sick locomotive that needs the indicator applied, and its aid in diagnosing the malady will often effect great saving at little expense. Every master mechanic who applies the indicator in this spirit will find the instrument a profitable investment.

Western Railway Club.

At the December meeting of this club the first subject discussed was

DEFECTIVE WHEELS.

Mr. G. W. Rhodes, C. B. & Q., offered an amendment to Rule 9, as follows: "Steel tired wheels will be allowed to run with flanges worn down to ¾-inch thick."

Mr. B. K. Verbryck, C., R. I. & P., opposed the motion on the plea that it would make the flange too thin.

Mr. L. E. Johnson, C., B. & Q. supported the motion, and insisted that steel tires might safely be run till they were worn to ¾ inch

Mr. F. D. Casanave, P., F. W. & C., believed it depended on the kind of tire the fastening had whether or not it could be run safely to ¾ inch.

Mr. Rhodes said that a steel flange ¾ inch thick was stronger than a cast iron flange 1 inch thick.

Mr. Wm. Forsyth thought there was no doubt but a steel flange ¾ inch thick was strong enough, but he thought running the wheel till that amount of wear took place would make it so wide between flanges that there would be danger of one flange striking the point of a frog.

Mr. Schroyer, C. & N. W., took the same view. He thought if steel tired wheels were to be run till the flanges were ¾ inch thick, the wheels should be pressed further on the axle.

Mr. Rhodes showed that the increased lateral play would not be sufficient to bring about the element of danger suggested by Mr. Forsyth.

After some more discussion the motion was carried.

BROKEN DRAW-BARS.

The committee appointed to recommend rules respecting the replacing of draw-bars broken in the interchange of cars reported that they consider that as far as cast-iron draw-bars are concerned, the price and credit as defined in Rule 25 is satisfactory. But in the case of patent draw-bars applied for the purpose of tests, that cost a much larger sum than the ordinary standard draw-bars of the road that applies them for such tests, no more should be charged than the cost of the standard draw-bars of such company. In case of roads having several kinds of draw-bars in use cars should not be refused that have different draw-bars in each end, as is frequently the case if they conform to the draw-bars in use by such company. It is not supposed that our inspectors are acquainted with all the different kinds of draw-bars in use by foreign roads, and the committee are of the opinion that if draw-bars are of the right length and in good order, cars should not be refused if draw-bars are not of the same kind in each end of the cars, even if they are not of the same standards of the roads owning the cars.

B. K. Verbryck, J. Townsend, Committee.

Mr. Rhodes moved to strike out the last clause of the report.

Mr. Schroyer complained that some roads took part in the Master Mechanics' Conventions and helped to establish standards, yet never do anything toward putting the system into practice by adopting such standards themselves.

Secretary Sinclair believed that the adoption of the last clause of the report would enable roads that had no desire to act fairly toward interchanging roads, to carry out their unscrupulous practice still more freely than they can now.

Mr. Johnson thought the adoption of the clause referred to would open the door to some parties who would put anything in the shape of a draw-bar upon a car. He also objected to companies merely putting on a standard draw-bar in place of an experimental draw-bar, and thought it unfair toward those who were experimenting.

President Scott complained of roads that are using expensive draw-bars that break like pipe stems. He did not think it was equitable that other companies should be compelled to pay for the breakage of expensive draw-bars that were constantly breaking, and could not be used without an excessive amount of breakage. Railroad companies, he believed, would run appliances that were a failure longer than any other people. For the reason given he favored the rule as reported.

Mr. Forsyth did not think it was fair that roads should be compelled to pay for weak draw-bars persistently used, but he favored roads supporting experiments that were intended for the benefit of all.

After some further discussion the motion to strike out the last clause of the report was carried.

INTERCHANGE RULES 9, 10 AND 11.

Mr. Verbryck said there was great difficulty in deciding with certainty when a wheel had been slid. It was not certain that a flat spot would be found on the opposite wheel. Respecting treads, he was having his cast-iron and steel-tired wheels made to conform with the section adopted by the M. C. B. Association. He thought if all roads followed this rule there would be no damage done by frogs chipping the tire tread. He was uncertain whether or not it was best to reject a wheel because a flange was slightly chipped. The rule that reads, "wheels out of gauge may be refitted," he wanted changed to read, "wheels out of gauge shall be fitted to the gauge of the company owning the car." Mr. Verbryck was in favor of Rule 11 being changed to admit representatives of private companies owning cars to the M. C. B. Association.

A long discussion arose on the betterment of cars in making repairs.

Mr. Schroyer held that Rules 9 and 12 conflicted, and moved to add to Rule 12, "In case a company damaging wheels or axles and giving defect cards, the company making the betterment in repairs will be governed by the charges under Rule 12." This was carried. The other rules were passed without recommendation of any change.

PACKING FOR PISTON HEADS AND STUFFING-BOXES.

Mr. Johnson opened the discussion in the absence of Mr. Cooper. He was not prepared to give any points about cylinder packing, but would say something about stuffing-box packing. They had been using metallic packing exclusively lately, and have used it to some extent since 1881. With this packing piston rods average 50,000 miles without turning, then turning off $\frac{1}{64}$-inch generally trues the rod. At this rate a piston rod will endure throughout the life of an engine. The wear of the valve stems is greater than that of piston rods, but they run about 25,000 miles between turnings, and then from $\frac{1}{64}$ to $\frac{1}{32}$ inch taken off trues them. Cost of maintaining the packing is extremely light. Three passenger engines making 250 miles daily with the heaviest trains and handled by six crews, ran from May to December, 1886, and used only 36 cents' worth of material. When hemp was used for packing, the average life of a piston rod was four years, and a valve stem did not run longer than two years. At one shop where there were 119 engines when hemp was used, it took one lathe constantly turning valve stems, and two lathes on piston rod work. At the present time in the same shop, with 120 engines, one lathe does all the piston and piston rod work and a considerable part of the valve stem work. The packing is a modification of the Jerome metallic packing.

Secretary Sinclair had some experience with the same kind of packing, and testified to its efficiency and economy, regarded metallic packing as being superior in every way to fibrous packing, but thought it was essential that metallic packing should be made to rise and fall with the piston rod. If it did not have the means of automatically adjusting itself it would not keep tight, and the efforts made to keep it from blowing would injure the rods.

Mr. Casanave knew of some metallic packing that has cost nearly 19 cents per 1,000 miles to keep in repair, being quite as expensive as hemp.

Mr. C. E. Smart, Michigan Central, has one passenger engine with metallic packing that has run 41,000 miles in seven months, and the rods show hardly any sign of wear. Other engines are using the same kind of packing, but they have not had it in use long enough to determine its value.

Mr. Sinclair said that the rods must be trued up before metallic packing is first applied, or it is not likely to prove satisfactory.

Mr. Rhodes—The packing mentioned by Mr. Johnson has not always done well. There was considerable trouble with it at first, and some of the master mechanics were in favor of abandoning it. The packing will not give satisfaction unless it is taken care of and kept well lubricated.

Mr. W. W. Reynolds, C. C. & S. L., is using metallic packing. One engine made 60,000 miles with no expense whatever. The packing costs $45 for a complete set, but it can be made for about $13.

After some more discussion the subject was closed.

Secretary Sinclair offered the following:

Resolved, that the Western Railway Club have learned with sorrow of the death of Mr. William Woodcock, president of the Railway Master Mechanics' Association; and of Mr. Leander Garey, long president of the Master Car Builders' Association, and that we extend our sympathy to the families who have suffered this sad bereavement.

Mr. Wm Swanston, C. C. & S. L., one of the oldest members of the Master Mechanics' Association, spoke warmly of the many excellent qualities of Mr. Woodcock.

Mr. Verbryck, present president of the Master Car-Builders' Association, paid a high tribute of respect to the memory of Mr. Garey.

Mr. Rogan spoke of his pleasant business relations with Mr. Garey.

Meeting adjourned.

Care of Paint on Passenger Cars.

The following paper on this subject was read at the recent convention of the Master Car and Locomotive Painters' Association by Mr. Joseph J. Murphy, Master Painter of the Louisville & Nashville road:

When this subject was assigned me I was pleased that I had such an easy one, as I supposed, and I did not give it much attention farther than to read the heading. After I began to look into it I found it had grown in importance, that it had assumed gigantic proportions, until they reached such a magnitude that I feel unable to handle the subject as it should be done. For, as I see it, the care and attention given to passenger cars after being painted is one of great importance. It is the most important subject that has been before us since the organization of the Association. It is a subject that has to be considered from several points and under different lights. The first is the importance of it to the different railroads. For the painting on some of the roads forms quite an item of expense. Heretofore we considered durability as the first object to be attained, and we always kept that in sight; but I think that the importance of the care and attention

that a car receives after painting outranks a durable job at the start, for no matter how durable the job may be, it can very soon be ruined by the care, or rather the lack of care, it receives when in service. Another point to consider is, are the parties in charge of car cleaning as capable as they should be? do they thoroughly understand the nature of paint and varnish and how to clean it so as to get the best results without injuring the painting?

I believe, as a general thing, they do not understand it, and I know of cars on which the painting was ruined by the ignorance of the one in charge of the cleaning. Another point is the patent soaps or liquid cleaners that are on the market, and warranted to clean the cars without injury to the varnish in the slightest particular. Soaps that any one can apply, do not require to be and are not applied by intelligent men, and the result of constant use of them is soon apparent upon the varnish of the car. It would be better for the painting if no soap whatever was used on the cars when they are cleaned at the end of each trip. The changes that could be recommended to lengthen the durability of our painting are most too numerous to mention, and with a few suggestions from me I will leave the subject for you to discuss, as it will come in under the head of improvements in methods and materials.

One of the suggestions is to have in charge of the general car cleaning department one who understands the nature of paint and varnish; a practical painter would be the best one to oversee and direct the cleaning a car receives at the end of each trip. Second, for the master painter to be able to get the car in the paint shop for revarnishing, or cleaning and oiling, without revarnishing, when in his judgment the car should need it, and before the life of the paint and varnish is too far gone for revarnishing to do it any real good. We have all found that it is not well to allow a car to run longer than nine months on its first varnish, and I am in favor of bringing in the car at the end of six months, as nearly all cars will clean speedily and well at the end of that time, while it will take longer to do the same work if allowed to run nine months, cleaning it well with pulverized pumice stone and water, using no soap, and, if time will permit, apply two coats of finishing varnish, but if the time will not permit, it will be safe to allow it to run on one coat, and if no varnish can be applied after cleaning, the car should have a coat of oil mixed, three parts oil and one part turpentine, and wiped off carefully, leaving no oil upon the surface of the car. And my experience is that a coat of oil properly applied often gives better results than a coat of varnish, as it restores the life or rather the oil that the elements or atmospheric influences have abstracted from the varnish without adding any more gum upon the surface of the paint. Third, the quality of the material used in painting will have a tendency to either prolong or diminish the work. But as this will be ably discussed by Messrs. Rattenbury and Ledford in subject No. 6 I will say no more about it. Fourth, to use finishing varnish only upon the outside of our cars will prolong the life of our painting, using no rubbing varnish whatever upon the outside, as a great deal of our trouble can be traced to the use of rubbing varnish. I have used finishing varnish only upon the outside for the past nine years with splendid results, and I know there are several members here who have also discarded the use of rubbing varnish on the outside, and the same holds good upon the inside of the car, for if we discard the use of inside varnish and use instead three parts rubbing and one part finishing we will have better results. Cars varnished in this way will clean better than if inside varnish was used, and the chances of cracking are reduced to a minimum. Fourth. Another trouble with our coaches is the body color. It is, as a general rule, selected by the general manager or superintendent with a view to please the eye, and the durability of the color is not taken into consideration, and the painter has to mix several different pigments to produce the shade selected. Some of the pigments may be fugitive in their nature and soon fade. The result is, after a few months the coach appears and is quite different from what it was when first painted, and all the washing and varnishing will not restore it to its original color. To remedy this I would select the most durable pigments, discarding all those that have the slightest tendency to fade, no matter how handsome they were in color, and if possible, use only one color without any other color being added to it. It will reduce the trouble when necessary to match an old job, for matching old faded body color is one of the many troubles that fall to the lot of the painter.

In conclusion, I will say that it is not my purpose, neither is it the object of this association, to dictate to the general managers or master car-builders as to the color or the care and attention they give their cars; but it is a subject well worthy of their careful consideration, for, as a general rule, they themselves have to shoulder the burden of both the painting and car-cleaning upon their expense account. And to those who purchase paint stock, I would mildly suggest that the best of its kind is always the cheapest, and in no case is it more forcibly felt than in the paint shop. They purchase the best iron, the best steel and the best quality of lumber, and why not keep on to the end of the chapter and give the poor painter the best stock? They would soon find it economy to do so, and it is a consummation devoutly to be wished for.

Master Car-Builders' Club.

The regular monthly meeting of the Club was held at the rooms, 113 Liberty street, New York, on Thursday evening, Dec. 16.

Mr. C. A. Smith called the meeting to order, and moved that Mr. W. R. Davenport take the chair, which motion was carried.

Mr. Davenport, on taking the chair, said he understood of course that his appointment was temporary, and was only to continue until a successor should be chosen to fill the vacancy caused by the death of the late President, Leander Garey.

Mr. Smith then moved that Mr. C. E. Garey be chosen President of the Club, which was unanimously carried.

Mr. Garey, on taking the chair, said: I do not suppose, gentlemen, that any remarks are expected from me on this occasion. You are as well aware as I am that this chair has been well and honorably filled by my deceased brother, and only for that reason do I assume the obligation for the remainder of his term of office, and I suppose that it would be fitting that a committee be appointed to draw up resolutions expressing the sympathy of this club with his family.

On motion, Messrs. C. A. Smith, Willis Davis, W. R. Davenport, J. T. Leighton and C. R. Woodin, were appointed such committee, the resolutions to be presented at the next regular meeting of the Club.

The chairman then announced that the subject for discussion at the present meeting was

CAR WHEELS.

Mr. Davenport opened the discussion. He said he had hoped that when the Master Car-Builders' Association adopted a wheel tread, it would be one which embodied modern ideas on the subject. The height of flange which had been adopted was $1\frac{1}{8}$ inch, and this he found was objected to by men of experience, who favored a height of not more than 1 inch. But $1\frac{1}{8}$ inch had been made the standard, and there was nothing to do but make the best of it. You all know, said Mr. D., the position I took with regard to the radius of the root of the flange. It seemed to me that inasmuch as we had traveled toward something larger, it was really a step backwards to go to $\frac{5}{8}$. I only here put myself on record as believing that the time will come when we will wish we had made it $\frac{3}{4}$. I think if we get a chance to vote on this again we will make it $\frac{3}{4}$, because it has been demonstrated by wiser heads than mine that this is as small a radius as should be at that point, and that metal there, as Mr. Forney said in his report, was very precious metal. When we cut it out and throw it away, we throw away a good many thousand miles of wear and a great many hundreds of thousands of dollars for our company. I think the wheel is going to be a good wheel. I think it would have been a better wheel if we could have had a $\frac{3}{4}$ radius and an inch flange. I presume that the Pennsylvania road will not change their heighth of flange from one inch, and that other roads will do the same. A gentleman said to me after the discussion at the last convention, "Now don't say a word about it; you know it is only a difference of $\frac{1}{8}$ anyhow, and who is going to measure that difference?" But when we are doing a thing I like to see it done fair and square. We are looked to by our companies for advanced thought, and not to run the tread-mill business and come out the next day where we started.

Mr. Coolbaugh: I am anxious to hear about the defect recently discovered in the cast wheel.

Mr. Smith: The defect in the wheel was a crack right along in the throat which is imperceptible. After the wheel has run a short time you can take a sledge and knock that piece right off. That is the defect. I do not know that it is an entirely new one. I am rather inclined to think not. We want wheelmakers to tell what causes that defect. It is in cast wheels. I had a few very short replies from some wheelmakers, asking what the defect was. I could not tell them. Some of them I think could tell whether the cause of the crack is in the metal or in the pouring, or what it is.

Mr. Davenport: I have heard different reasons assigned for that. The theory of one man is that in pouring the wheel it may be that some accident has occurred that for a moment has caused the man pouring the wheel to slack up and then pour again, and it gave an opportunity for the oxidizing of the surface before the next volume of metal flowed over it, and that this prevented a union of the particles. The objection to that would be that, if oxidation took place in one portion of the wheel, would it not take place in the entire circumference? Now, if it should be found that every wheel so affected had this cold-shut, or whatever you choose to call it, through the entire circumference, then it would look as though this theory were correct. It might be a fault in the pouring.

Another man suggests that in certain conditions steam may be set free in the mold during the process of pouring, and that if conditions exist so as to permit that steam to produce oxidation, that would do it, and then the metal flowing over would cover it up so that it would not be perceptible until the wheel had made perhaps ten or twenty thousand miles.

Mr. Coolbaugh: I would ask whether this defect is observable in a new wheel or in a wheel that has made a certain mileage?

Mr. Smith: I have never seen it myself. I do not understand that it appears in a new wheel at all. I would like to ask some wheelmakers if they have changed to the new standard, or if they propose to do so, or have had any orders for wheels of the new form. We can only get at the value of it by an expression of opinion from those who use it and make it.

Mr. Davenport: Well, I should say that anticipating what was coming and believing that this would be adopted, we anticipated the change in our chills. We have made a little change in the back of our flange to accommodate those roads running on 4–$8\frac{1}{2}$, and having to interchange on 4–9. The back of the flange, we found, was making trouble with guard rails on the 4–9 tracks, and we pared off a little metal at the most projecting point and put it on below. We have carried out that $\frac{3}{16}$ of an inch, which will make a difference of $\frac{3}{8}$ of an inch between the measurements of a pair of wheels fitted. I explained that to a 4–9 man. He said, "That is just what we want."

Of course, we do not claim any originality for that. Running that metal down a little farther was all that he did, and we were complimented by our 4–$8\frac{1}{2}$ customers, and it relieved them of any trouble with regard to limit gauges. You know sometimes they used to have trouble with limit gauges on the Pennsylvania system which threw their cars out, and yet they were fitted according to their standard 4–$8\frac{1}{2}$, and when they came to run over a 4–9 gauge, the limit gaugers would gauge them, occasionally make trouble. But paring off $\frac{3}{16}$ of an inch prevented any trouble. If their men had made a slight mistake in fitting, it would not throw the car. But we will have to come right into the arrangement, and put that on now in order to be strictly in line.

Mr. Smith: After getting the flange worn so that there will be a short, thin flange there, would you have any trouble as to its breaking off?

Mr. Davenport: No sir; never had any. The $\frac{3}{16}$ is away out of the truth. There is not enough metal there to amount to a hill of beans. We carry it underneath so that the wheel is more benefitted by that metal, as any wheelmaker or railroad man will understand at a glance.

Mr. Griffiths: Mr. Sax wishes me to say that the wheels that he has been making, and for which he has some orders, have a flange of $1\frac{1}{8}$ inch, and the radius of the flange is $\frac{5}{8}$; but as to the tread of the wheel, I don't know myself whether it corresponds with the standards you speak of or not. I believe that it does not bevel. The bevel from the foot of the flange to the outside of the tread is not continuous. I see by the engraving that the bevel from the foot of the flange is $\frac{1}{16}$ inch to a point $1\frac{1}{4}$ inch from the outside of the wheel. The only difference is that his is straight. The Lehigh Valley, I believe, have about 3,000 wheels of that section in use. It seems that the only difference in the section is that in this wheel there is a slight bevel part way across the tread and in his there is not.

Mr. Hopkins: There is in every car a bending up of the axle at the center between the wheels. The load standing outside the wheel causes this bending, so much so that in a test made by our late president, Mr. Garey, he found that the wheels were $\frac{5}{8}$ of an inch nearer at the bottom than they were at the top. So that the wheels, instead of standing perpendicular, stood inclined in. Where there is an inequality in the track and the load comes down with force, the axle springs up more than at other times. If the wheel is out of round to some extent and should act a little like an eccentric on the track, there would be a violent springing of the axle which can not take place without slipping, as the wheels are brought nearer together at the bottom, that is, nearer on the track than they are at the upper side; so it can not occur without the wheels slipping laterally upon the rail, and that, of course, becomes an extreme element of wear, as it occurs hundreds of times in a mile run. In the old cars we did not have any thing like the load in proportion to the strength of the axle that we have now, and it becomes a very important question whether all the efforts that the wheelmakers have made to give us a better wheel are not largely lost by reason of this very slipping of the wheels in toward each other from the springing up of the axle at the center. Now, in the case supposed, the cars must necessarily pull very much harder. You cannot slip the wheels on the rail without consuming power, and the bringing of the wheels any nearer to each other counts for nothing under heaven but the consumption of power and the wear and tear of wheels and rails.

Mr. Smith: I would like to ask some of the wheelmakers how much heavier they are making wheels in view of the fact that some of the railroad companies are increasing their loads; or if they do not make any allowance for the increased load, how much difference they think there should be in the weight of a wheel for a 25 or 30 ton car.

Mr. Garey: If my memory serves me the standard axle has been materially strengthened in the center since the test referred to by Mr. Hopkins was made, so that the axle is now very much stiffer than it was before; and while, doubtless, there is some of the abrasion he speaks of occurring under heavy cars, it is not nearly as much as it would have been without the strengthening of the axle; and it seems to me that, in justice to wheelmakers, it should be said that there are other causes that come in and make the life of a wheel less than what it ought to be. In the fitting of wheels, when we get right into the car shop where work is done, there is a great deal there which accounts for poor service of wheels I think. For instance, I was very much surprised some two years ago, after putting up a wheel grinding machine to find how much my new wheels were out of center on the axle, even up to a quarter of an inch. I noticed in looking over a circular of the car wheel grinding company, that they had advocated six-point dogs instead of three, so I got a set of dogs and fitted them up to my wheel-boring machine, and I found that it made about two-thirds difference; that is, I would get my wheels within $\frac{1}{16}$ of an inch, taking not a quarter of the time to grind them. Now, if a wheel was perfectly round, a three-point dog would be all right. But I do not suppose you can get a perfectly round wheel. By dividing the points into six parts, it brings the bore of the wheel for the axle very near to the center, even if the wheel is not perfectly round, and consequently there is less time required to grind it. I think the grinding of the chilled wheels, for passenger service, at least, is an important matter, and for my part I think it would be well to grind wheels for freight service. This truing-up wheels and then putting the axle in afterwards, as some people are doing, I do not think is the best way. The wheel should be ground on the axle already fitted up.

And then another thing—I think our railroad companies help to make poor wheels very materially. They want to get something for nothing, and how they can get more than a hundred cents out of a dollar I do not understand. By paying the lowest possible price for wheels is just the way to get poor wheel service.

Mr. Coolbaugh: I would like to know if any one can account for the great difference in flange wear. I understand that the Lehigh Valley condemn nine per cent. of their wheels because of flange wear. I know of another road that condemns twenty-nine per cent. of their wheels. The gauges I believe are the same, the service about the same, the curvatures about the same, yet there is a difference of twenty per cent. How is it accounted for?

[A lengthy conversational discussion followed in reference to flange wear and other topics, which we omit, as it was mainly a re petition of what has been often said before.]

Mr. Davenport: I once asked a railroad man in high position why railroad companies were not disposed to encourage the manufacture of a better chilled iron wheel. "Well," he said, "you know they led us to pay a pretty good price on the steel wheel, and they want to take it off the chilled wheel." Now, it seems to me that if the railways are so blind to their own interests that they are not able to see the importance of encouraging improvements in the manufacture of chilled iron wheels, it is very strange, for certainly more than nine-tenths of their equipment they propose to have mounted on these wheels. It is only a certain class of cars that they will put the steel-tired wheels under. One railway company has recently gotten out specifications looking to a better chilled iron wheel. That is an encouraging sign. Now, if it is possible for them to keep a mileage record and buy their wheels by the thousand miles run, it will be a long step toward great improvement in chilled wheels. I believe in the American chilled wheel, and that we have great advantages in this country for their manufacture. I believe it can be made so perfect that it will be the safest, and by all odds the cheapest, by the thousand miles run of any wheel manufactured. Of course, I am glad to welcome our brethren of the steel-tired persuasion, and it is very interesting to hear them tell about the bad points that have been developed in the other fellow's steel-tired wheels. Of course, they have overcome the difficulty, and that I am glad of.

After some further discussion, it was moved that the subject for the January meeting be "Automatic Couplers for Freight Cars," which was agreed to.

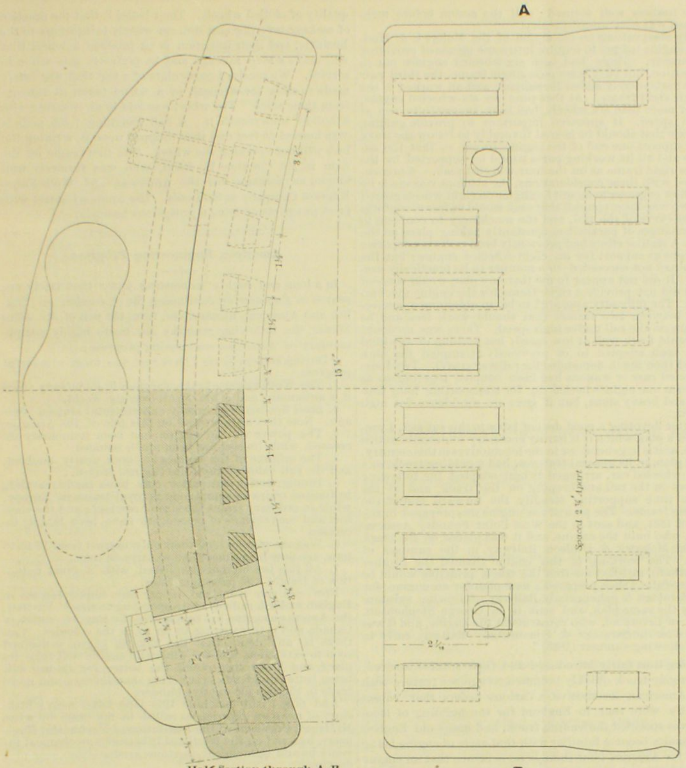
The meeting being ready to adjourn, Mr. Smith said: There is another thing on the call for our present meeting, and that is the desirability of changing the name and location of this Club. I do not think we are in a position to do that now. This is our situation: We have leased these rooms until the 1st of May, and what is better, we have got money enough to pay all the expenses until then. Perhaps some of you may think it better to defer the consideration of this question until our lease expires here.

On motion of Mr. Davenport; its further consideration was deferred until the February meeting.

Chicago, Milwaukee & St. Paul Rolling Stock.

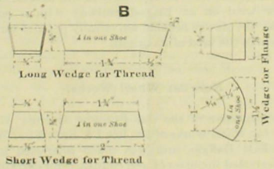
The railroad in America with the longest mileage operated under the same officers is the Chicago, Milwaukee & St. Paul, which has 5,131 miles of track, and is, therefore, the longest railroad in the world. The work of operating is done by 696 locomotives and 19,948 cars. At the end of the company's last fiscal year they had in use as passenger equipment 295 day cars, 48 sleeping cars, 8 parlor cars, 9 dining cars, 215 postal, mail and express cars. The company is said to own locomotives made by every building company in America that ever built twenty engines. In such a collection, they have a great many locomotives that ought to be in the scrap heap, yet the average mileage made last year was very fair, all engines belonging to the road having made 20,603,377, or over 30,000 miles per engine. The expense of operating the locomotives was high. Repairs cost 4.80 cents per mile, the wages of engineers, firemen and wipers was 7.20 cents per mile, oil and waste cost 1 cent, and fuel cost 9.90 cents, a total of 22.90 cents per mile run. The locomotives belonging to the Chicago & Northwestern Railway, which run through much about the same territory as those on the C., M. & St. P., and do similar work, cost 3.95 cents for repairs, 6.95 cents for engineers, firemen and wipers, 6.91 cents for fuel and .47 cent for oil and waste, a total of 18.28 cents per train mile. This lower expense of operating makes considerable difference on the net nearings of a great railroad like the Chicago & Northwestern. Had the Milwaukee locomotives been operated at a total cost of 18.28 cents per train mile, the company would have increased the net earnings $955,876, or nearly one million of dollars annually. The fuel account of the C., M. & St. P. locomotives is unusually high. The average locomotive belonging to the road has the smallest proportion of heating surface to cylinder capacity of any locomotive in the Northwest. If the matter were investigated, we are safe to say that a close relation would be found between the high fuel account and the small heating surfaces of the boilers.

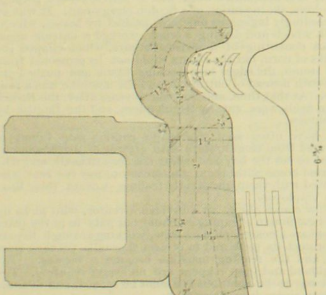
A



Half Section through A-B

B





Section through C-D

DEVICE FOR TRUEING LOCOMOTIVE DRIVING WHEELS.

The shoe illustrated in the engraving was designed by Mr. James Meehan, superintendent of motive power and machinery of the Cincinnati, New Orleans & Texas Pacific Railway, for trueing up locomotive driving wheels that through wear of the tread have got a ridge left on the outside of the tire tread. The shoe has pieces of hard Muchet steel inserted on the part that will rest on the portion of the tire that needs reducing, and the shoe is applied when the engine or car is in service in the same way as a brake shoe is used. The intention is to use blocks of emery secured to the shoe to true up chilled cast iron wheels. The device has been applied very successfully to locomotives. It is found that the hard pieces act like scrapers, very quickly reducing the protuberance that is so destructive to frogs, and sends many locomotives to the shops for tire turning when every other part about the engine is in good running order. The inside flange is reduced in the same way. The pieces of steel are laid in the sand and cast in the shoe, the slow cooling not having the effect of softening this steel by annealing it. We understand the device has been patented.

Promotions on the Chicago, Burlington & Quincy.

Mr. L. E. Johnson, master mechanic, Aurora, Ill., has been promoted to the position of superintendent of the Iowa & Missouri divisions of the road. Mr. Johnson was a very popular and efficient master mechanic, and he has proved a very valuable and hard-working member of the Western Railway Club. We extend our warmest congratulations on his well-merited promotion.

Mr. A. Forsyth, master mechanic at Beardstown, has been promoted to Aurora. Mr. Forsyth, who is of a quiet, retiring disposition, is known as an excellent mechanic and a good organizer, which will insure him success in his extended sphere of work.

Mr. Philip Wallis, engineer of tests at Aurora, succeeds Mr. Forsyth at Beardstown. Mr. Wallis is of a class that our future master mechanics are destined to be largely drawn from, with decided benefit to all concerned. He is a graduate of the Stevens Institute, and is one of the kind who was not above putting on overalls and going to work in a machine shop after he left the technical school. He was for some time foreman in the machine shops at Aurora, but for several years has attended exclusively to physical tests. Some of the work he did this summer with the dynamometer car is of high scientific value. Mr. Herr, another graduate of Stevens Institute, who also went to work in the machine shop after he left school, will be successor to Mr. Wallis. The writer has spent considerable time of late watching the last-mentioned two young engineers doing their test work, and he was filled with admiration of their exact methods, untiring industry, and faithful performance of the duties assigned to them.

Communications.

Engine Mileage.—Letter from "Charles Dickens."

LONDON & NORTHWESTERN RAILWAY LOCOMOTIVE DEPARTMENT, CREWE, Nov. 15, 1886.

A. Sinclair, Esq.:

DEAR SIR: I inclose you in the form of a letter, a statement of the mileage made by one of our engines. Perhaps you may think it of sufficient interest to put in a corner of your valuable paper. Yours faithfully,

F. W. WEBB.

Editors National Car and Locomotive Builder:

As long mileage and regular work is often recorded in our mechanical engineering newspapers, I have thought that my performance since I was turned out of Crewe's Works, on February 6, 1882, would interest your readers.

As soon as I was built I was sent to Longsight, my builder being anxious to see the greatest amount of work I could do in the shortest possible time; and it was arranged that I should run as often as I could from Manchester to London and back for a day's work, and for that purpose I was put in the charge of David Pennington and Leigh Bowden, the proposed work being more than one man could do and at the same time take necessary care of myself and the passengers.

I commenced running on March 3, 1882, taking the 7:45 A. M. train out of Manchester, and returning with the 4 o'clock out of London; and this work I have done regularly—in fair weather and foul, in snow or rain—with the exception of forty-eight trips when I was on the sick list. This work, together with other odd runs I have made, gives 501,135 as the total number of miles I have run: in fact, I am so regularly on the road, that my friends whom I have carried safely so often between Manchester and London, instead of mentioning the time of the train they propose to travel by, say "We'll go with Charles Dickens!"

On Sept. 7, 1886, I was sent home to Crewe, needing further medical treatment and a new suit of clothes, and am glad to say that I am now in vigorous health and again on the 7:45 out of Manchester.

I have made 1,327 journeys to Euston and back and 55 other trips during the past four years and a half, which gives an average daily mileage of over 362, and I think the distance I have run in that time will compare very favorably with any of my sisters in this country or even with the best performance of our cousins on the other side of the Atlantic, and I shall be glad at all times to see my many thousand friends whom I have previously carried.

I am, etc., "CHARLES DICKENS" (Engine No. 955).

LONGSIGHT STATION,
London & Northwestern Railway.

I have no objection to this letter from "Charles Dickens" being published and certify the statements made are correct.

F. W. WEBB.

CREWE, Nov. 11, 1886.

Locomotive Performance in Texas.

Editors National Car and Locomotive Builder:

The reports published in your issues from time to time concerning consumption of fuel and wear of tires have induced me to drop you a line to show what is done in this section. I am the more induced to do this since so few reports ever appear from this part of the country, and it is only right that your many readers should know something of what is going on in railroad performance in this "Lone Star" State.

To begin with, then: This road (the Houston, East & West Texas, joined with the Shreveport & Houston) is 232 miles long, running from Houston, Texas, to Shreveport, Louisiana. The track is narrow gauge. Our tires give a mileage of from 30,000 to 33,000 miles before a first turning is required. I turn them three times. After the last turning we get 25,000 miles from them before consigning them to the scrap heap.

The form of flange conforms very nearly with the standard adopted by the Railway Club. Your readers will see from this that our little wheels on narrow track come very nearly up to the published records of the big wheelers on standard gauge track. In consumption of fuel I challenge your readers anywhere to produce a better record than that of our engines. Our road engines burn wood, and use in summer, when traffic is light and road good, only one cord of wood to 49 miles, and in winter, when traffic is heavy and road bad, only one cord of wood to 44 miles. Now ye standard gaugers anywhere beat that if ye can.

This amount of 49 and 44 miles is the general average only, including freight, passenger, etc. On the passenger run we have three engines, one a Bailey engine with cylinders 11 by 16 and drivers 42 inches, and two engines of Dickson make with cylinders 12 by 18 and drivers 45 inches. These engines haul a train of one baggage car and two coaches of sixty passenger each, and use only one cord of wood to make from 65 to 70 miles.

I attribute the greater part of this excellent showing to Sterne's patented turbine spark arrester, which not only saves fuel, but is also most successful in preventing sparks. We use them on our wood burners (wood being our fuel), but they are equally successful with coal. Although we have hauled many thousand bales of cotton, we have

never yet had a cotton fire due to sparks from the stack. No other road in this section can say as much.

So you see that while we of this section seldom appear in your paper, and while many may regard us as outside the railroad circle, yet in some things we come up very nearly to our more pretentious brothers, and in our spark arrester we surpass them all in saving of fuel and safety from fire.

E. A. CAMPBELL,
Supt. M. P. & M., H., E. & W. T. Ry.

HOUSTON, TEX., Dec. 15, 1886.

Wear of Brake-Shoes.

Editors National Car and Locomotive Builder :

A communication appeared in your December number, signed "D. W. H.," replying to an editorial paragraph in the November number, asking for information relative to the average cost of brake-shoes for every thousand miles run. "D. W. H." states that as the brake-shoe is used for stopping and not for running the train, he thinks the number of miles run has nothing to do with the matter. Is he sure that brake-shoes are not used at all on heavy down grades, or even very frequently on level roads to lessen slightly the speed of a train? It seems to the writer that in order to compare the cost of brake-shoes with other items of expense, such as wheels, journal bearings, oil, waste, etc., their cost should be shown in like manner—*i. e.*, the average expense for every thousand miles run, keeping separate the passenger and freight service if deemed advisable. The writer has in his possession a report from a well-known official of a prominent western road, showing the average cost of brake-shoes during an entire year, used on the road with which he is connected, to have been 17.80 cents for every thousand miles run.

M.

Origin of the Engine Truck.

In the course of a very fair and highly interesting discussion on the relative merits of English and American locomotives, the *Mechanical World*, of Manchester, Eng., while speaking of the engine truck universally used with America locomnotives, makes the assertion that the invention is of British origin. Our English contemporaries have repeated this assertion so often that it is generally believed in the British Isles, but we venture to question its correctness. If the *Mechanical World* means, merely, that the four-wheel vehicle called in America a truck and in Britain a bogie is an English invention, we are not prepared to dispute the question; although we believe carriages with all the elements of the truck were used in Asia and Africa at a period when the dwellers in Britain were still performing savage rites in the temples of Thor and Woden. But if our contemporary means to say that British engineers or locomotive builders were the first to apply to carrying the front end of a locomotive, a four-wheel vehicle with wheel base independent of that in which the driving wheels were secured, we assuredly hold that it is mistaken. On this question Robert Stephenson is reported to have said that he had seen bogies at work under coal wagons in New Castle before a locomotive was built in America. That was accepted as proof that the device was an English invention, but we fail to see the case in that light. The patent records show that some English inventors had thought of applying the bogie system, such as was afterwards developed by Fairlie, to the locomotive years before the Liverpool & Manchester Railway was projected, but there is no evidence that the idea was ever put into material form.

The sole credit of applying the truck to the locomotive is due to John B. Jervis, one of America's most eminent engineers, and the leading pioneer of American railroad progress. The truck arrangement appears very simple now, and extremely obvious as a means of making a locomotive pass easily round a curve. But, like many other great inventions, its simplicity was only apparent after a master mind had applied it to practice. We are not dependent upon hearsay or second-hand evidence as to how the invention of the engine truck was worked out. In his book on "Railway Property," Mr. Jervis relates the matter quite fully. He says:

"In 1831, the Mohawk & Hudson Railway Company imported an engine from England made under the direction of George Stephenson, the distinguished engineer in this department of the profession. This engine was on four wheels, all drivers, and weighed about seven tons. The wheels were four feet diameter and the axles four and a half feet apart from center to center. The performance of the engine was at that time satisfactory as to power. The frame was twelve feet long, and the axles being four and a half feet apart, it projected beyond the bearing on the axles nearly four feet each way. It was readily observed that a vertical inequality in the surface of the rails caused a vertical motion at the ends of the frame of about double this inequality, producing an unsteady and shaking motion to the frame of the engine very unfavorable to the machinery and the enginemen. It was further evident that this leverage action of the frame was unfavorable to the truck. The first thought for a remedy for this difficulty was to spread the axles further apart; but to do this to such an extent as would materially remedy the evil was at that time con-considered inadmissible on account of the increased labor and danger it would cause in passing curves in the line of railway. The track of the Mohawk & Hudson Company was a well constructed one of the kind, very direct and in good order; it was a flat bar or plate rail laid on southern pine timbers well secured; still the action before mentioned was very unsatisfactory.

My observations on the action of the Mohawk & Hudson engine led me to inquire into some means of providing a remedy. There had been six-wheeled engines put in operation, but they were on a single frame, the third pair of wheels merely added for support and all worked in the single rigid frame. At that time no six-wheeled engine, or of more than six wheels, had been successfully run at high speed. It appeared important to provide guiding wheels that should be geared favorably to follow the track and support one end of the engine frame, so that the engine and all its working parts would be supported by the same rigid frame as on the four-wheeled plan. While engaged with these considerations, the attempt was made by a fellow engineer to mount an engine on eight wheels geared as two wagons so coupled that each would be free to conform to the curve of the rail, and the machinery to conform to the changes of parallelism constantly taking place on the rail. A similar effort had previously been made to adapt two wagons as support for an eight-wheeled engine; but the plan had not succeeded in a manner to be practically useful. It did not appear to me that any plan would succeed that did not provide a rigid frame for the engine machinery. The difficulty appeared to be in obtaining a connection between two frames that should work free and be secure on the rail under high speed. There was no doubt it would work well at low speed; but nothing of the kind had been adapted to or previously attempted for high speed then much demanded for railway travel. Two four-wheeled cars or wagons had been coupled together so as to form one eight-wheeled car for transporting long timber and heavy stone, but it gave no confidence for high speed.

After devoting a good deal of labor to this subject, I prepared a plan which it is hardly necessary to describe at this time, as it is in general use in the locomotives in this country. This plan, in its general features, had a guiding truck, or a four-wheeled car, arranged as best adapted for following curves on the rail and keeping on the track, and at the same time supporting steadily the forward end of the engine frame. The plan of the engine was prepared in the fall of 1831, and sent to the West Point Foundry Association, who built the engine, and it was placed on the track of the Mohawk & Hudson Railway in the summer of 1832. The working of this engine (named the Brother Jonathan), satisfied me that the truck principle would be successful. I then prepared a new plan for an engine for the Saratoga & Schenectady Railway, following substantially the same plan, and sent it to George Stephenson, Esq., of Liverpool, who constructed the engine, and it was placed on the Saratoga & Schenectady Railway early in the following summer (1833)."

Being thus fairly introduced and their success assured, the engine truck quickly became a recognized feature with the American locomotive. Various orders that subsequently were sent to England for the building of locomotives specified the leading truck, and many old English mechanics become familiar with that style of engine being built for America; but there is no evidence that an engine was ever tried on an English railway with a leading bogie till the device became universally popular through its success in the land of its origin.

New Car Wheel Works.

A representative of the CAR-BUILDER recently visited the new car wheel works of the Rood & Brown Car Wheel Co., at East Buffalo, and was much interested in the highly perfected facilities of the company for carrying on the various operations for wheel making. The works are very convenient of access, being opposite the old passenger depot of the New York Central, and close to the station of the Buffalo Belt Line, and they will have unusually good shipping facilities, having a frontage on the New York Central tracks, and being in close proximity to the Lake Shore, the Erie, the West Shore, the Buffalo, Rochester & Pittsburgh, the Lehigh Valley, and the Buffalo, New York & Philadelphia Railroads. The plot on which the works are built has a frontage on Howard street of 165 feet, and is 425 feet deep, running through to the New York Central tracks, and, in addition, there is an adjoining lot of 90 × 150 feet which can be used for storing of material or for future extension. The buildings embrace all the latest improvements introduced into works of this kind, are well lighted and arranged so that material will be handled no more than is actually necessary. The foundry is a brick building 75 × 150 feet, with a wing 22 × 42 feet, containing the cupolas. Adjoining this is a building 35 × 150 feet for stores, patterns, etc. The patterns are arranged on an indexed system, which prevents any delay in finding the pattern wanted. Narrow gauge tracks traverse all parts of the buildings where heavy material has to be moved, swing and traveling cranes are provided for handling the heavy ladles and wheels, and a complete plant of Fairbanks scales is ready at convenient points for recording the weights. The machinery is driven by a 50 horse-power engine, located in a house adjoining the foundry.

The present capacity of the works is 150 wheels a day, but the output could be largely increased on short notice with very little expense. The production of the wheels is under the immediate supervision of one of the partners in the firm, Mr. Henry M. Brown, who was for years manager of the Scoville Car Wheel Works, and for two years superintendent of the Buffalo Car Wheel Works, and is therefore an expert in the business. He is attending closely to the selection of the iron, and employs in the foundry none but skillful and reliable men, who have long experience in this branch of molding. The best quality of Salisbury, Lake Superior and Southern is used, and it is the intention of the firm to make nothing but the best quality of chilled wheels. Their belief is that the practice of making inferior cast iron car wheels is injurious to the business, and their intention is to produce a wheel that will make a long mileage and be perfectly safe while in service. We received particulars of a test that was lately made to show the strength of a wheel taken at random from their stock. The wheel was laid in an iron ring with a hollow underneath it. A ball weighing 1,235 pounds was hoisted 25 feet and then dropped upon it, striking the hub without breaking the wheel. The first name on the firm is Mr. Clarence E. Rood, who was formerly well known as manager for the American and Wells Fargo Express Company at St. Louis. The company starts with good prospects of doing a prosperous business.

American Engineering Progress.

In a long and highly interesting letter that lately appeared in *Engineering* continuing the discussion on English and American locomotives, from the pen of Mr. John Fernie, the following remarks are made highly complimentary of American engineering progress:

"During sixteen years I have seen the most wonderful progress.

1. The Westinghouse brake was then in its infancy; now it is automatic, and is known all over the world.
2. Steel fire-boxes were only experimental sixteen years ago. Now they are universal on this side of the Atlantic.
3. The power of the engine has been immensely increased, while its cost has been much reduced.
4. The mileage of the engines has been nearly doubled, and the full value of duplicate engines proved.
5. Dining, buffet and parlor cars have made traveling by limited trains as sumptuous as royal trains in Europe, while in ordinary trains the size of carriages and the comfort and convenience of passengers have been largely increased.
6. Wagons (cars) which then only carried from 10 to 15 tons, are now being increased to carry 30 tons.
7. All this has been accomplished with a great reduction of freight and passenger rates.

Now, can you point out to me any improvements in English or Irish railways corresponding to this? Further, the American engine has supplanted the English engine in Canada and is threatening to do so in the colonies. Can there be any doubt that the English engine is doomed soon to extinction, and the American engine will take its place, and I say the sooner the better, for its use will bring better dividends to suffering shareholders, and more trade to English locomotive builders.

And now I will conclude this long letter with a little story of my own experiences called to my mind by what Mr. Head, President of the Institution of Mechanical Engineers, has said on the relationship between mechanical inventions and economical questions arising from over production.

My first apprentice work was to help to erect a reaping machine, the invention of a Scotch clergyman. It was an exceedingly ingenious machine, pushed by horses, which, with wheels and driving a crank, worked a cutting apparatus consisting of a series of shears, which clipped the stalks of corn, but the shears could not be protected from the stones, the edges soon became blunt and pushed out the corn instead of cutting it, and the machine was a failure. At that time, and for many years after, the Scotch corn fields were cut by Highlanders and the English by Irishmen.

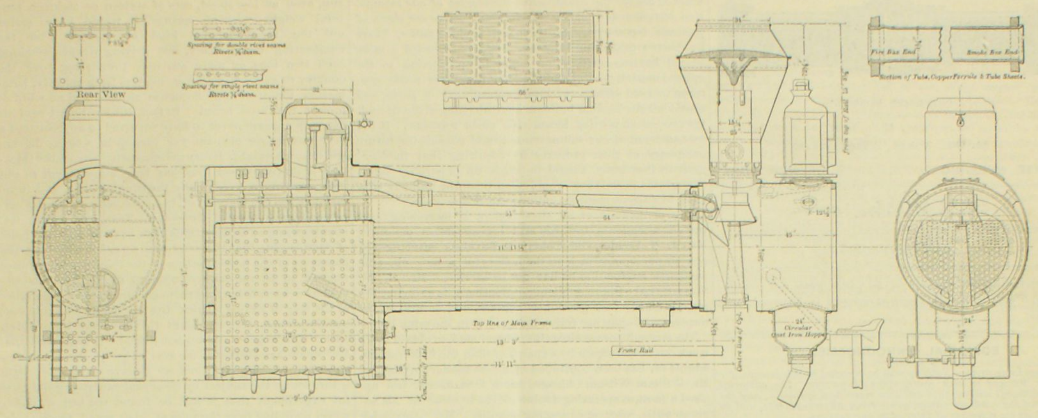
I have often seen steamships coming into Liverpool covered from stem to stern with crowds of Irishmen who came to cut the hay and shear the corn (wheat), and who carried home with them the money to pay the rent, and carried with them also kindly feelings toward their English employers.

Now comes along an American inventor, who picks up the Scotchman's reaping machine, but puts in in the place of shears a coarse pitched saw, working through fingers to protect its teeth and to protect the stalks till they were cut, and the reaping machine became a success. The Highland and Irish reapers are no longer required. The rent has to be paid, but it cannot be earned, and dissatisfaction ripens into Home Rule.

Meantime, the reaping machine grows and extends all over the world, and becomes a self-binder, again reducing the value of labor. Then come cheap ocean freights, cheap railways, and cheap locomotives, bringing the product of the rich fields of Kansas and Nebraska, this time to cut out the farmer and the landlord. How much of the philosophy of Home Rule lies in the reaping machine, and from it on the mechanical engineer?

But the moral I want to point out by this story is not a political but a mechanical one. The reaping machine is by no means the only machine we have given up in despair, and the Americans have stepped in and perfected. I could give many examples of good things we have thrown away, as not being good enough for us, but which the American engineers have retained and improved, and made good enough for themselves and for all the world, and when I am told American engineers are using things which are obsolete, that their locomotives were much inferior in design, material and endurance to English engines, and their fire-boxes much narrower, I raise my shoulders and say with the new Sibyl who hails from New York, "Sir, it would be ludicrous to compare the engines of the two countries together."

THE Schenectady Locomotive Works have completed two large and powerful engines for the Colorado Midland. The boilers are made of Otis steel $\frac{9}{16}$ in. thick, are 60 in. in diameter, with extended fronts and 234 tubes, 13 ft. long and $2\frac{1}{4}$ in. diameter. The fire-boxes are $42\frac{3}{8}$ in. wide, $57\frac{1}{2}$ in. deep in front and $54\frac{1}{2}$ in. at the back. There are 8 driving wheels 57 in. in diameter, cylinders 20x24 in., tank capacity 3,500 gallons, weight of engine 62 tons, 56 of which are on drivers. The works have contracted to build 25 more of the same class of engines for the same road. They are to run between Colorado Springs and Leadville upon grades of 210 ft. to the mile.



LOCOMOTIVE BOILER—NORTHERN PACIFIC RAILROAD.

The locomotive boiler shown in the engraving was designed by Mr. G. W. Cushing, superintendent of motive power, for his 18 x 24 inches eight-wheel locomotives. The style of boiler can be so well understood from an examination of the engravings that a detailed description is hardly necessary. The boiler is of the wagon-top type, with a waist 56 inches diameter at the smallest ring, and capable of holding 234 tubes 2 inches diameter and 12 feet long. The fire-box is 72 inches long and 33¾ inches wide inside. The material used in the construction of boiler and fire-box is steel throughout. The boiler shell is ½ inch thick riveted with ⅞ inch rivets placed not more than 2¼ inches from center to center, all horizontal seams and junction of waist being double riveted, with centers not more than 3¼ inches apart. Side and back sheets of fire-box are 5/16 inch thick, crown sheets ⅜ inch and flue sheet ½ inch thick.

The fire-box is fitted with the smoke-preventing device illustrated in the NATIONAL CAR AND LOCOMOTIVE BUILDER of November last. The boiler provides about 1,500 square feet of heating surface.

Power of Locomotives.

The practice introduced within the last few years of measuring with accurate dynamometers the force exerted by locomotives in pulling all kinds of trains at all varieties of speed, has demonstrated that the formula for calculating train resistances arranged by eminent engineers and received for years without question, is not applicable to American railroad trains. There now seem to be indications that the formula propounded long ago for calculating the tractive power of locomotives, does not truly work out the power developed by American locomotives, although it looks like questioning the accuracy of a mathematical demonstration to dispute the correctness of the traction formula.

The formula which is said to have been first propounded by Pambour is well known to all intelligent railroad men, and is stated :

$$T = \frac{d^2\,l\,p}{D}$$

d = diameter of the cylinder in inches.
l = length of stroke in inches.
p = the mean effective pressure on the piston in pounds per square inch.
D = diameter of driving wheels in inches.
T = the tractive force at the rail in pounds.

This is not an empirical formula, but is a short way of calculating the pressure of steam on both pistons transmitted to the compound levers which the driving wheels are.

Doubt was first publicly thrown on the accuracy of the power so calculated by Mr. C. D. Hudson, General Manager of the East Tennessee, Virginia & Georgia Railroad, in a paper read before the Western Society of Engineers, March 2, 1886. Mr. Hudson gave the particulars of numerous tests, among which the following is a fair example.

"Grade as follows from point where tail of train stood :

100 feet	+ 1.06	100 feet	+ .72
" "	+ 1.09	" "	+ .96
" "	+ 1.25	" "	+ 1.09
" "	+ .96	" "	+ 1.21
" "	+ .82	" "	+ .98*
" "	+ .91	" "	+ 1.13*
" "	+ .90		
" "	+ .91	Average	.952

* On 6° curve.

Track steel, ballasted with sand, and in good shape.

"Engine 63, 60 tons; cars, 16 to 30 and 3 to 15 = 28 675.85 tons; total, 735.85 tons. Steam, 130 lbs.; took them fifteen car-lengths and until engine was 200 feet upon the six-degree curve ; no sand, wheels did not slip ; moved them at rate of two or three miles per hour.

Now, the power of engine 63, estimated by the usual formula, would be as follows:

$$\frac{17 \times 17 \times 24}{58} \times \text{steam pressure in cylinder} = 119.59 + \text{pressure in cylinder.}$$

The average grade was .952 = 50.27 feet per mile.

The resistance due gravity would be .952 × 2,000 = 19.04 lbs. per ton ; resistances due other causes (exps. 8 to 22), 4.40 lbs. per ton ; total, 23.44 lbs. per ton.

In the last case the weight moved was 735.85 tons, which at 23.44 lbs. gives a force of 17,616 lbs., required to move it up that grade.

As 119.59 × cylinder pressure = force (power of engine), then force = cylinder pressure ÷ 119.59.

As force in this case is 17,616, we have:

$$\frac{17{,}616}{119.59} = \text{cylinder pressure} = 144 \text{ lbs.}$$

"But as the steam pressure in the boiler is but 130 lbs., it could not have been 144 in the cylinder. It might possibly have been 125 lbs. At that figure we would have a theoretical force of 119.59 × 125 = 14,949 lbs. Now, the actual resistance was 17,616 lbs., or more than the theoretical power, 2,667 lbs., or 18 per cent above it.

There can be no doubt as to the effect of gravity, viz. : 19.04 lbs. per ton ; this, for 735.85 tons, will give 14,010 lbs., which would leave for other resistances, assuming the force of engine to be at 125 lbs. in cylinders, 14,949 lbs. ; this would leave but 939 lbs. for all other resistances, or, per ton moved, 1.27 lbs.

"Our other experiments prove that this cannot be correct ; we must, therefore, conclude that the formula for estimating the power is not correct. If we now discard the weight of the engine and use only the weight of the train, we have moved 679.85 tons, which at 23.44 pounds resistance per ton, gives 15,936 pounds as the force required to move it. If we now assume that at that slow speed the cylinder pressure was equal to that in the boiler (hardly probable), we will have the power of the engine, 119.55 × 130 = 15,547 pounds, pretty nearly equal to the estimated force required to move the load aside from the engine. You will note that the force required to move the load, including the engine, is 43.5 per cent. of the weight on the drivers, comparing favorably with the experiments upon the Erie road many years ago, when one-third of such weight was utilized. In ordinary practice, however, but one-fifth is calculated upon as available."

To an ordinary man familiar with the handling of trains, it would appear that the engine developed enough power to pull the train on the grade, and only stalled when the additional resistance due to the curve was encountered. One of our contemporaries which has discussed the matter with considerable ingenuity, holds that the engine was able to do the work by storing power in the draw-bar springs during the portions of the revolution when the pistons were exerting the greatest force. That means of storing power and the starting velocity which may be obtained from slack couplings, may enable an engine to start a train heavier than she can keep going, but we fail to see how it could enable an engine to haul a train nearly 500 feet on a dead pull. In this case there was no indication that a head of speed was got from loose couplings. A locomotive develops of course the most power at the portions of the stroke when the crank approaches closest to the quarter, but that does not increase the average rotation power which in this case would be equal to the constant rotative effort on a crank 7.64 inches long.

It appears a rash proceeding to question the correctness of a rule founded on simple leverage, but we have met with a great many facts that appear to support the position taken by Mr. Hudson. In a series of carefully conducted tests with the indicator, carried out two years ago on locomotives pulling trains over a grade of well-known steepness, we found that after deducting the power required for raising the train up the hill, there was seldom two pounds per ton left for other resistances. We were careful to see that none of the power was due to a head of velocity gained before the heavy pulling begun. The diagrams were taken during a long, steady pull, when neither acceleration nor retardation was acting to vitiate the record. We felt, however, that the traction rule must be right, and that there must be something wrong with the profile figures, and on that account did not make the results of the tests public. Since then, however, we have had excellent opportunities for watching the work done by the engineers of tests with the dynamometer car belonging to the Chicago, Burlington & Quincy Railroad Company, and the facts observed there strongly substantiate the correctness of Mr. Hudson's conclusions, and by inference indicate that the engines we tested developed more power than the formula calls for. We will give more particulars in a future issue.

A Dynamometer Applied to Slide Valves.

The mechanical department of the Chicago, Burlington & Quincy road are using a most ingeniously devised dynamometer, which they have invented, or rather developed from a defective invention for testing the power required to move slide valves. A small hydraulic ram is employed, which fits on the standard valve stem. A head of water for the ram is carried in a vessel fastened to the sand box. The intensity and variation of pressure is recorded on the paper-covered drum of an ordinary engine indicator. The intention is to demonstrate by the use of this instrument the percentage of power required to move different kinds of valves under the varying conditions they are subjected to in service. This provides an excellent means of testing the exact value of balanced as compared with the unbalanced valves, and of sight continuous feed lubricators for locomotive cylinders, and we understand the intention is to make the experiments necessary to do so. The movement of this dynamometer is so delicate that the valve stem is only lengthened or shortened 1/16 inch for the heaviest tests.

Fast Turning of Axles.

There is something fishy in the stories frequently told about the number of car axles that one man can turn on certain lathes in the course of a day. Ask the agent for a lathe of this kind how many axles a good man will turn with his lathe, and he will generally say from twelve to fifteen. We have been watching the output of axle lathes in the best shops for some time, and find that one axle an hour is fair average work. An exception to this is a man doing piece-work in the Chicago, Burlington & Quincy shops, at Aurora, who turns twenty-five axles in seventeen hours. This is not a fish story either. We would commend the man who does this extraordinary work to the attention of an agent who will readily identify himself in connection with an axle lathe story. The agent went into a railroad shop one day and was boasting a little about his lathes and the work they could do. One of them happened to be in the shop, and the foreman had never been able to get more than twelve axles through it in ten hours, and that performance was by an exceptionally expert hand. This foreman said to the agent that ten axles a day was about the capacity of the lathes, and the agent readily asserted that he could turn out sixteen axles in ten hours. The foreman quietly pulled out his wallet and, taking out fifty dollars, said he would give the money to the agent if he would turn out more than twelve axles in ten hours. No attempt was made to earn the money.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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BY

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

Locomotives Built in 1886.

The business of locomotive building rises and falls like a trade barometer influenced by the condition of railroad securities, but the curves of ascent to prosperity and of descent to depression appear to be steeper than the lines representing the fluctuations of any other important business. Throughout the year 1885, the demand for new locomotives was so small that several of the building firms had to quit the business, and others retained only workmen enough to keep their leading tools moving. When last year opened, the prospects of business had slightly improved, and the improvement advanced so rapidly that at the close of the year most of the locomotive shops were running close to their full capacity, with orders ahead. Seven of the leading locomotive builders turned out 1,221 new engines during the year, the same firms having constructed 800 locomotives the previous year, which shows a gratifying increase of business, especially when it is considered that the greater portion of the additional work was done during the last six months of the year.

There are fifteen establishments in the United States and one in Canada engaged in locomotive building as a business. A few of the companies, mostly the smaller shops, declined to reveal their output for the past year, but by private inquiries we found how many engines they had built, and our estimate is that the total number of locomotives built in contract shops was 1,527. From the data sent us by master mechanics in reply to letters of inquiry, and from information obtained in various ways that are quite reliable, we calculate that 275 new locomotives were built in railroad shops, making a grand total of 1,802 engines constructed in the United States and Canada during the past year. The prices have ruled low, but the tendency has been toward very heavy machines, so that the amount of capital invested in the new locomotives cannot be less than $15,000,000. As the greater portion of money paid for locomotives went in payment of labor, skilled and unskilled, principally the former, it may be readily seen how much influence the condition of the locomotive building trade exercises upon the prosperity of manufacturing centers.

The production of locomotives in 1886 was large compared to that of the previous year, but it was not equal to the natural increase of railroad rolling stock. The *Railway Age* reports records of more than 7,000 miles of new railroad built during the year, which would call for 700 locomotives, nearly the half of the whole number built. The railroads in the United States use at present 27,900 locomotives and those in Canada 1,376 locomotives to do the work of transportation. The economical life of a locomotive is not much beyond 25 years. There are now so many locomotives in service that are more than 25 years old, that nearly 1,000 of them ought to be broken up annually to keep the remaining stock within the age that the engines could be run without ruinous expenditure for repairs. When the requirements of transportation make new locomotives in active demand, there are few worn out engines that find their way to the scrap heap. It looks as if none of the locomotives built last year were used to fill the blanks due to age and wear, the increased need due to extended mileage and the growth of the carrying business having absorbed the whole output.

The locomotives built during the past year exhibit in a marked degree the conservative tendencies of our locomotive designers and master mechanics. There are signs of progress, but they are mostly in well trodden paths. There has been a gratifying tendency displayed toward a more liberal heating surface of boiler in proportion to the cubical capacity of cylinders. All first-class roads continue to hold strictly to interchangeability of parts, and nearly all the leading builders have abandoned the fit-and-try process of putting locomotive parts together. If the management of our minor roads would consult the future prosperity of their property by requiring that the locomotives they order should be made up of strictly interchangeable parts, they would soon push the builders who cling to ancient methods entirely out of the trade.

The percentage of all steel boilers is increasing, and there is a tendency towards still higher steam pressure. Mr. J. N. Lauder, Old Colony Railroad, is carrying 175 pounds per square inch on the boilers of a new class of passenger engine that he has got in service. Mr. G. W. Stevens, Lake Shore & Michigan Southern, is carrying 180 pounds on his fast passenger engines, and several other master mechanics are following quietly in the same line.

The struggle, never altogether abandoned, to obtain more work out of the steam by expansion than the link motion admits of, has been continued by a few master mechanics. Mr. William Wilson, Chicago, Alton & St. Louis, has applied a motion operating double valves to some of his engines with very encouraging results. Mr. Alexander Mitchell, Lehigh Valley, has built a locomotive after the Strong patents which embody a motion operating separate admission and release valves, and Mr. A. J. Stevens, Central Pacific Railroad, continues his experiments with a special motion operating a valve at each end of the cylinders.

The oddities in locomotive construction during the year have been a heavy freight engine built by Mr. Alexander Mitchell, with two large corrugated flues for furnaces, something like the Fox furnaces so much used in marine boilers. Some motors were built by the Baldwin Locomotive Works, to use soda as a means of storing the heat required to generate steam for each trip. The same firm built two Decapod locomotives with five pairs of driving wheels coupled and a leading two-wheel truck.

Six or seven years ago locomotives with more than eight wheels coupled were looked upon with hatred by most railroad men, although a few far seeing leaders advocated the use for freight service of heavier engines resting on three or more pairs of drivers. The progress in this direction is now so decided that the locomotive builders put up last year about as many engines with three pairs of drivers and over as there were eight-wheel engines built. The continuous brakes already in use on so many freight trains is already creating a demand for larger wheels for the mogul and consolidation engines in use, the small wheels not being equal to the speed requirements.

While there are no striking marks of progress to record, there are no acts of retrogression or departures from engineering common sense. No improvement promises to reduce the cost of operating 50 per cent., but on the other hand no one is insisting that restricting the free admission of steam to the cylinders will promote economy, and no one is trying to increase the efficiency of the locomotive by transmitting the power through friction wheels.

Unresilient Parts of Rolling Stock.

There are few phases of rolling stock construction or action in service that have not been thoroughly investigated and minutely discussed by the men in charge of railroad machinery, or by associations composed of such men, yet the subject introduced by Mr. C. E. Smart, general master mechanic of the Michigan Central Railroad, in the letter read at the last meeting of the Western Railroad Club, and published in another page, has received almost no consideration, has never been publicly discussed in any of the association meetings, and yet all reflective men will acknowledge that it is of supreme importance to the life of rolling stock and to the durability of rails.

American railroad engineers from the earliest days of their business have been noted for devoting great solicitude and intelligent attention to applying means of saving the rails from undue wear and tear; and the introducing of an elastic element between the load of railroad vehicles and the rail has ever been a favorite method that tended to increase the durability of rails. The railroad spring system was first thoroughly developed by American engineers and mechanics, and the elaborations of this system indicate how important the matter of softening the blow of the wheel has always been considered. Yet there is reason to fear that, while the utmost skill and ingenuity have been devoted to the perfecting of appliances that would prevent the carriage portion of rolling stock from transmitting rigid blows to the rails through the wheels, the condition of the wheels has been neglected. The constant demand for heavier locomotives has led to rapid increase of the weight of all the parts, till now there are many driving wheels running, each of which, with the half of its axle, weighs more than the load per wheel on cars that were fully loaded only a few years ago. Had a proposal been made fifteen years ago to run, even at low speed, cars of sixteen or eighteen tons total weight without springs, it would have called out the most vigorous kind of protests from the engineering departments, but driving wheels weighing each two tons or more are now thundering over the country in every direction at express train velocity, hammering the steel like immense sledges, and no word of protest has been heard. In fact, till Mr. Smart read his paper, it appears never to have occurred to any one that a very destructive element was present in a heavy driving wheel's own weight. Every movement to increase the thickness of driving wheel tires has been a movement to put more unresilient weight into the running gear, and in no instance has the increase of tire thickness produced a corresponding increase of tire wear. Nearly all master mechanics using extremely thick tires have been in the habit of complaining that the wear was unsatisfactory, but the character of the inside portion of the thick tire was always reputed to be the cause of reduced durability. The tire makers acknowledge that there are mechanical difficulties in the way of rolling a thick tire so dense as a thin one, but the outside portion ought to show very little difference. This is generally acknowledged. It looks then that Mr. Smart has suggested the real cause of the unsatisfactory wear of thick tires, and we believe when more light is thrown on the subject by observant experience and careful experiment that it will be found the heavy driving wheel pounding over the rails at high speed tends to destroy the tire and the rail both.

There are a great many tenders in use where the springs are set between the truck and the tender frame. By this arrangement the whole weight of the truck and wheels is hammered upon the rail without the softening cushion of any spring. The capacity of tenders has been greatly increased of late, and the trucks that carry them have to be made correspondingly heavy. Every increase in the weight of these parts must greatly intensify the blows delivered to track joints by the wheels carrying such viciously designed tender trucks. Defective appliances of that kind might be used without much injury, in the days of slow running, but all trains have to run sometimes at too great velocity nowadays for such unmechanical devices to be employed without danger. If the cause of the broken rails that annually destroy so much life and property could be traced, there is reason to fear that heavy driving wheels and trucks without springs would be found responsible for much of the damage.

Have We a F.eld for Compound Locomotives?

In the NATIONAL CAR AND LOCOMOTIVE BUILDER, of November, appeared engravings and description of one of Webb's compound locomotives. We spoke favorably of the economical performance of a locomotive of the class illustrated, and invited American locomotive builders to give the system a trial. Commenting on this article, the *Mechanical Engineer* says:

"We have never been able to see where the steam was to come from to supply the low pressure cylinder of a locomotive hauling a passenger train. If we remember rightly, the high speed card of a locomotive resembles nothing so much as a boomerang, so that the moiety left for the low-pressure cylinder would not be of any value whatever: it certainly would not clear the exhaust nozzle unless punched out through it by the low-pressure piston. There are times when the compound system might be available even on passenger engines, but at high speed, never, we think. Upon freight engines and coal-hauling locomotives there is a margin of power unexpended in the exhaust, and, if it has enough vitality after getting out of the low-pressure cylinder to keep the smoke box clear, or, in other words, to make a good blast, compounding locomotives would save money to railways."

We believe, with our contemporary, that locomotives pulling heavy freight trains offer the most promising field for compounding, and we cannot understand why more attention has not been devoted to improving this class of engine. There are locomotives working daily on this continent that utilize none of the economical advantages to be derived from the expansive power of steam. The engines are worked on long steady pulls at their full power, the lap of valves being useful only in cutting off early enough to permit most of the steam to escape before the beginning of the return stroke. It is of more importance to get cars moved promptly by few engines than to save several tons of coal on a division trip, so the sensible policy is followed of giving each engine every car she can pull. If low-pressure cylinders were added to our heavy freight engines we believe they could be made to do as much work as they are now performing at greatly reduced expense for fuel.

But we do not think the application of the compound system must necessarily be confined to heavy freight locomotives. The appearance of an indicator card taken from a locomotive running a high speed passenger train depends very much on the amount of work the engine has to do to keep the train going. If the engine is powerful and the train very light, the card will have a somewhat club-like shape, but when an engine has to keep express trains going, such as are run on the New York Central, the Erie, the Pennsylvania and other roads moving heavy fast passenger trains, it will be found that the terminal pressure of the average card is high enough to perform good work in a low pressure cylinder. The Lake Shore & Michi-

gan Southern Railway Company are running on their fast passenger trains locomotives that carry 180 pounds pressure per square inch of boiler. The engines have a stroke of 24 inches, and the valve motion is the ordinary shifting link. Admitting that at high speed the initial pressure comes down to 160 pounds and is cut off at 6 inches of the stroke, we will have less than two volumes of expansion when release takes place. In fact, the valve opens for exhaust at 16¼ inches of the stroke, so that the pressure of the released steam is over 50 pounds, a tension that is doing good honest work as initial pressure on the greater proportion of engines throughout the country. So long as the link motion is retained with the simple engine, nothing materially better than this degree of expansion can be obtained, the consequence being that increase of efficiency or economy does not keep pace with the increase of boiler pressure.

Providing the means of obtaining a wider range of expansion does not constitute the whole merits claimed for the compound system. Those who have studied steam-engineering most thoroughly are aware that in all simple steam engines there is a serious loss of efficiency caused by condensation of steam in the cylinder. In fact all cylinders act as a condenser to the steam that enters them, and the loss of heat due to this cause is much greater than is usually understood to be the case. As the pressure in the cylinder decreases, the water condensed from the steam at the beginning of the stroke is re-evaporated, and in a simple engine passes into the atmosphere. With a compound engine this redeemed source of potential energy passes into the low pressure cylinder and is utilized in doing work, so that the compound system does something more than provide the means of expanding the steam.

We believe that the compound system, as applied to locomotives, is still experimental, but that its promises of reward in the shape of economy are sufficiently good to justify enterprising railroad companies in giving the principle a trial. Since our engravings of the Webb locomotive appeared we have had several inquiries from advanced railroad engineers that indicate a desire to give the system a trial. We hope, for the credit of American mechanical enterprise, that the experiment will be made soon.

Feeing the Sleeping Car Porter.

A report which was without foundation was recently circulated that the Wisconsin Central Railroad Company, which operate their own sleeping cars, had issued strict orders that the porters should accept no gratuity from passengers, and a loud cry of thankfulness was heard far and wide by the Northwestern press. It seems to us, that this practice of paying a small fee to the sleeping car porter for services rendered, receives more attention from the press generally than the subject deserves. To pay 25 cents beyond the ordinary charge of sleeping car fare, may appear an enormity to the rural editor who fails to obtain any reduction of the regular sleeping car rates, but our observations lead us to believe that the average American traveler regards it as no hardship to pay a small fee to the porter, and no rules that any railroad or sleeping car company can promulgate are likely to stop the practice. Tipping porters and waiters may be wrong in the abstract; it may be demoralizing to the recipients, yet they seem to stand the degradation very cheerfully; it may be un-American, yet the ordinary American falls very readily into the vice; and there is good reason to believe that the agitation against the practice proceeds not so much from those who hate the vice as from those who hate to part with their money and yet have not the moral stamina to appear odd by refusing the fee. The superintendents of dining cars object very strongly to their waiters receiving fees, but they are powerless to prevent travelers from slipping small silver coin into the hands of the men who carry in their victuals. This being the case, it will be harder to prevent travelers from giving some equivalent to the men who black their boots and act the part of valets. A tax which is regarded as no hardship in a hotel or in a private dwelling, is not likely to be considered an unbearable burden because it is paid in a railroad car.

Piston Valves in Locomotives.

Many attempts have been made in the United States to use piston valves for locomotives, but until lately results have been by no means encouraging. A piston valve has several features that recommend its application to locomotives. The valve is practically balanced, and can be made to provide a remarkably free means of exit for the exhaust steam without an increase of area that would be entirely inadmissible in a slide valve. The piston valve can be finished in a lathe and the seat can be bored out in the same machine. As a case of fitting and finishing all is simple and easy to reduce the first cost; but the objectionable attributes have nearly always appeared when a valve of this description had been in service for a few thousand miles, the inevitable wear making the valve smaller and the seat larger. Those who have applied piston valves to locomotives have generally concluded that no effectual means of compensating for the wear of parts could be devised, and after a time the valves of this description have gone to the scrap heap, the verdict being that the loss of steam from leakage caused greater waste of power than the friction of a slide valve amounted to.

Devices have frequently been applied to railroad machinery and rejected as impracticable or of no value and finally adopted again and demonstrated to be practicable and valuable. There is some reason to believe that the piston valve for locomotives, like several other appliances, is going to be revived successfully after many failures. At the last meeting of the Master Mechanics' Association, Mr. E. M. Roberts, master mechanic of the Ashland Coal and Iron Railway Company, reported that he was using a piston valve which was an unqualified success. Mr. Roberts uses rings to compensate for the effect of wear, just as in an ordinary steam piston.

We also learn that M. Ricour, a French locomotive superintendent, has met with decided success in using piston valves. This engineer has applied these valves to a number of his locomotives, and he reports that the wear of the latter is .25 inch for 125,000 miles, while slide valves only ran 2,060 miles to the same amount of wear, and where the piston valve was employed the wear of the valve gear was reduced in proportion. Careful tests were made to find how far the reduction of friction affected the coal consumption, and the discovery was made that the piston valve effected a saving of 12 per cent. in fuel.

Railroad—Railway.

According to Webster these two words have precisely the same meaning. If one of them could be made "standard" and the other wiped out of existence, what a relief it would be to editors, book-makers and a host of business men who are now plagued to know when to use one and when the other. The discrimination between them is a vexatious tax upon everybody's memory to no practical purpose. But let us by all means keep up the "distinction without a difference," lest the limitless resources of the language in the matter of diversity should be seriously curtailed. As an illustration of the part which these twin words play in current railroad literature, we append the following important railway announcement, an advance copy of which has been received by horseback express:

"The Spread Eagle Junction & Primrose Valley Railroad Company, having purchased the Thyatira & Susanville Railway, the two roads will hereafter be known as the 'Spread Eagle & Susanville Railroad and Railway System,' which also includes the Tiplerville Railroad Branch of the Hay Creek Railway, originally chartered as the Rat River & Frogtown Railroad. These railways, with their unrivaled railroad connections, now constitute the most direct railway communication with the Great Hemlock Gutter Trunk Railroad, which has now become the proprietary line of the Marrowfat Railway, the Squaw-Ranch Railroad, the Scuffletown Railway, the Shamrock & Unadilla Railroad, and the Pattagumpus & Sal Soda Railway, formerly known as the Smelfungus Railroad. A number of other contiguous railways now doing a precarious railroad business will be consolidated at an early day into the aforesaid system. With a view to greater brevity, however, it is proposed to shortenthe name of the system as it now stands, by consolidating the words 'railroad' and 'railway' into one word as soon as two-thirds of the board of directors can agree as to which word can be spared with least detriment to the interests of the company. A bare majority of the present directors prefer 'railroad,' and this majority is likely to be increased from the fact that President Cleveland in his recent annual message uses the word railroad four times and railway only once."

THERE is an impression among railroad men located in the older settled portions of the Uniled States, that railroad operating on frontier States is conducted on a rough and ready system that pays little attention to accuracy of methods or to economy in results. Such a belief is far from the truth. As testimony to the contrary we would direct attention to the letter published elsewhere on "Locomotive Performance in Texas," from Mr. E. A. Campbell, superintendent of motive power of the Houston, East & West Texas Railway. Mr. Campbell indicates a record which would be good on any railroad, and is especially creditable in a region where the choice of help is far from being select. We should like to hear from other precincts on the same subject, for no question excites more interest among our readers than the economical operating of locomotives.

Mr. John Player, master mechanic of the Central Iowa Railroad, has been using a scale-removing and preventing mixture in the boilers of his locomotives which, he finds, acts very vigorously on the scale, large quantities being found in the leg of the boiler by the boiler washer after the mixture has been in use. As successful scale removers have often contained a dangerous proportion of acid, we advised Mr. Player to put a piece of zinc in the mixture he is using, and keep it in a warm place for a few days. He did so, and kept the zinc soaking in the mixture for a week, but the metal showed no indication of corrosion. Water for boilers has been so scarce in Iowa this fall that no well is hard enough for rejection, and, as a result, may boilers are suffering badly from scale burning. A good, safe scale-reducing compound is likely to be a boon to railroads in that region.

Leander Garey.

The death of Mr. Garey, which occurred while our December, issue was going through the press, will cause a feeling of profound regret, not only among those to whom he was endeared by the ties of kindred and intimacy, but to the larger number with whom he came in contact in the intercourse of business. Especially will his loss be felt by his associates of the Car-Builders' Association, with the growth and usefulness of which he had been so continuously identified since its incipient organization some twenty years ago. To them, as well as to many others less directly connected with the car departments of railroads, his loss will be felt as a personal bereavement. His temperament and social qualities were such as to win the respect and esteem of every one who knew him. Uniformly affable and courteous, unobtrusive and cautious in the expression of his opinions, kindly, modest and conciliatory, yet having decided and well-considered views of his own upon controverted questions in railroad practice, he never gave way to hasty or harsh language or committed himself to measures that could not be consistently adhered to. These traits of character made him a safe counselor, and were the secret of his promotion, first as secretary of the Association of which he may be said to have been the founder, and secondly, as its presiding officer, a position to which he was elected for ten successive years.

Mr. Garey was born at Dover, Me., August 27, 1827, and died at Hartsdale, Westchester County, N. Y., Nov. 24, 1886, of typhoid malarial fever, in the 60th year of his age. For several years previous to 1873 he was the master car-builder of the New York & Harlem road, and had charge of the car shops at Morrisania, in Westchester County. In April, 1873, this road became a part of the New York Central system, and in October following, Mr. Garey was appointed Superintendent of the car shops of the New York Central & Hudson River Co. The duties imposed upon him by this promotion were arduous and involved great responsibility, and the efficient manner in which they were discharged is an evidence that the estimate of his capacity by Mr. Wm. H. Vanderbilt, then vice-president of the company, had not been undeserved. Mr. Garey held this position until Dec. 31, 1884, a little more than 11 years, when he retired from active railroad service and devoted himself to the care of his farm. Being a thorough, practical car-builder from life-long experience and application, he continued to take the same interest up to the time of his death that he had previously taken in questions discussed at the meetings of the Car-Builders' Association, and at the monthly meetings of the Master Car-Builders Club, in New York, over which he presided for a number of years.

William Woodcock.

Mr. William Woodcock, Master Mechanic of the Central Railroad of New Jersey, and President of the Railway Master Mechanics' Association, died of typhoid fever at his home in Elizabethport, N. J., November 27. By the death of Mr. Woodcock, the Master Mechanics' Association, the second time within two years, has to mourn the loss of its chief officer, and the railroad mechanical world loses one who was a credit to the engineering profession.

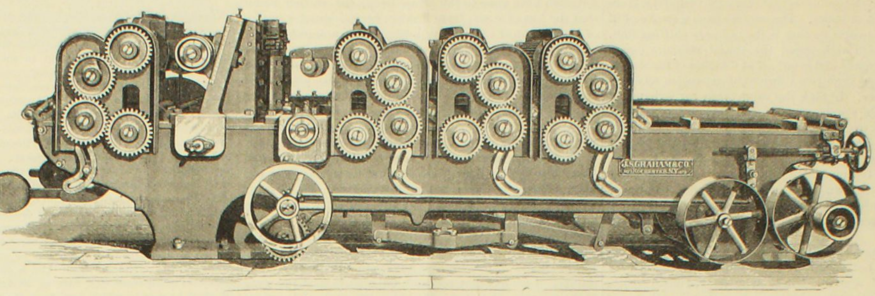
Mr. Woodcock was born in England in 1834, and came to this country with his parents when a child. They settled in Pennsylvania, and he learned the machinist trade in Parkersburg, Pa. The first railroad work he did was in 1861, in the Pennsylvania shops at Harrisburgh, Pa., where he was employed under Mr. T. W. Peeples, now of the New York elevated railroads, who got him promoted to the position of engine-house foreman of the West Philadelphia shops. He left that position to be foreman of the Delaware, Lackawanna & Western Railroad shops at Scranton, where he remained only six months, when he was appointed master mechanic of the Philadelphia, Germantown & Norristown Railroad. When the Central of New Jersey absorbed the latter road, Mr. Woodcock was moved in 1871 to Elizabethport as master mechanic with Mr. Peeples, who was then superintendent of motive power. Mr. Peeples left in 1876, and Mr. Woodcock was appointed to the higher position, which he worthily filled till his death.

Although of a most retiring disposition, Mr. Woodcock's modesty and want of self-assertion did not prevent his sterling qualities from being known to his neighbors and associates, and he received a considerable amount of public honors, which would have been increased had he not objected. He was a director of the Elizabeth General Hospital, a member of the Elizabeth Board of Education, a member of the City Board of Health, and a trustee of the Evergreen Cemetery. In 1876 a movement was started to run Mr. Woodcock for the State Assembly, and his election was regarded as certain, but he firmly refused the nomination. At the time of his death he was spoken of for mayor of Elizabeth.

Mr. Woodcock joined the Master Mechanics' Association in 1870, when the convention was held at Philadelphia. From the beginning of his connection with the Association he was noted as an industrious member, ready and willing to work on the investigations respecting railroad machinery. He did not speak often, but what he said was always listened to with the attention which speakers attract who never get on their feet unless they have something to say that is worth listening to. At the convention of 1872, two years after he became a member, he was first appointed a member of an investigating committee, and with one exception he was on one or more committees ever afterwards. His reports are noted for clear, good sense. Although naturally conservative about making changes on established forms, he had a keen eye to improvements, and was remarkably liberal in his treatment of inventions developed by others. At the convention held at Long Branch in 1884, Mr. Woodcock was elected second vice-president of the Master Mechanics' Association, and last year at Boston he was elected president.

The anthracite coal burning fast passenger locomotives, designed by Mr. Woodcock for the Central Railroad of New Jersey, are as successful engines as ever pulled a train and are an excellent monument to his efficiency as a designer.

Mr. Woodcock's wife died three years ago. They had no children, and the only member of Mr. Woodcock's family is a neice who was brought up like a daughter.



NEW AND IMPROVED TIMBER PLANING MACHINE.

The engraving represents a New and Improved Timber Planer, manufactured by J. S. Graham & Co., Rochester, N. Y., and adapted for use in ship yards, bridge and car works, or any establishment that is called upon to dress large timbers. A careful consideration of the following description and an inspection of the engraving will reveal many new and valuable features and improvements not found on any other machines used for like purposes.

This machine is built with eight rolls, 10 inches diameter, driven by powerful trains of gearing designed for the purpose. It will finish timber up to 20 inches wide and 12 inches thick, on all four sides, and will remove at least 1½ inches in thickness and 1¼ inches in the width at one operation. The frame is 18 feet long and is cast on the tubular section plan, having two thicknesses or plates of iron and hollow in the center and tied together by numerous struts at close intervals. The shipping weight of the machine is 19,000 pounds. All the cutter heads are made from steel forgings, bored their entire length and fitted with hammered hard tool-steel shafts under a pressure of from 100 to 120 tons, giving all the advantages of a steel head with a hard tool-steel shaft to resist wear. The upper cylinder is 9 inches diameter, with four knives, and the shaft is 2¼ inches diameter, turned true and accurately balanced. It is mounted in large boxes lined with the best genuine Babbitt metal. The pressure rolls on each side of the cylinder yield to the inequalities of the lumber and are used instead of bars on this particular style of machine to obviate friction and produce better general results. The cylinder and pressure rolls raise and lower together by turning one crank, which can be done while running. The boxes are gibbed to large heavy uprights that are a guarantee against vibration during the most severe service. The under cylinder is 7 inches diameter, four wings, with shaft 2 inches diameter, and is arranged to allow of a cut from zero to ⅝ of an inch. It runs in long bearings similar to the upper cylinder, all tied together in one casting. The side cutter heads are 7 inches diameter, four knives, with shafts 2 inches diameter, and have three large bearings, one being above the head, and all fitted with large wearing surfaces. The left hand head will travel across the machine and joint as narrow as 2 inches. The spindles run on improved self-oiling and self-adjusting step of steel and gun metal. The right hand head and guide can also be changed in location, obviating the wear of knives, rolls, pressure rolls, etc., in one place continually. All sliding surfaces are unusually large, carefully fitted, and arranged not to catch or hold gum or dirt. The rolls are fitted with shafts 3 inches diameter, connected with improved expansion gearing, and arranged to yield to any inequalities or thickness of timber and keep clear of gum. All the upper rolls are adjusted simultaneously by power while running. They receive pressure by weights and compound levers. The driving shaft is of steel, fitted with pulleys turned inside and outside and accurately balanced. By taking out the side heads, double surfacing 28 inches wide can be performed equally as well and fast as on the ordinary surfacing machine. The machine will feed from 25 to 60 feet per minute; tight and loose pulleys 16 inches diameter 12 inches face, unless otherwise ordered, and should make 900 revolutions per minute. Attention is called to the following points of superiority over other timber planers that will commend themselves to those interested:

1. The timber is fed by six feed rolls before reaching any of the cutters, thereby insuring powerful and positive feed.

2. The timber is dressed on the under side first, entering between the side cutters and upper cutters while traveling on perfect surfaces—the only way to secure positively square work, and produce finished timber that is more perfect than by any other process, and also to a great extent taking the wind or twist out of the timber—a very valuable feature that can be obtained only by dressing the under side first.

3. The lowering and raising of the lower feeding in rolls to obtain any desired amount of cut on the under side, according to the quality of the timber—a feature that is never obtained when the under side is finished last.

4. The dressing of the sides or edges of the timber after leaving the under cutter, guaranteeing the perfect squaring of the three sides as they are all acted upon within a space of 8½ inches from each other.

5. The timber passing under the top cutter head in a perfectly finished state and traveling on perfect surfaces, allowing the top cutter to remove the surplus thickness, and thereby insuring a finished timber that is absolutely square on all four sides.

6. The remarkably short distance between all the cutter heads bringing them all into action within the unusually short space of 22½ inches. By this feature it will be obvious to the observer that a long, winding timber can be kept perfectly square while being dressed—a process that cannot be obtained by other machines where the cutters are from 4 to 6 feet apart.

Proposed Reorganization of the Master Car-Builders' Club.

In pursuance of a call issued Nov. 26 by "The Committee," for a meeting to consider a plan for reorganizing the present Master Car-Builders' Club under a more comprehensive name, a meeting was held on Tuesday evening, Dec. 7, at the rooms of the club, 113 Liberty street, the proceedings of which are reported as follows:

Mr. R. C. Blackall, of the Delaware & Hudson Canal Co., was called to the chair and Mr. J. B. Brady, of the New York Central & Hudson River, acted as Secretary, some 40 prospective members in all were in attendance, but many letters and telegrams of an approving nature from prominent railroad men and friends were received and read. The matter was discussed at considerable length, and it was the unanimous opinion of all those present or represented by letter that such an organization would be of great advantage to all interested in railroad affairs, and that it would receive the necessary support if properly conducted.

A committee, consisting of W. R. Corwine, New York *World* and the *Time-Table*; William C. Tyler, *Railway Review*; Thos. Alcorn, West Shore Railroad; J. B. Brady, New York Central; R. C. Blackall, Delaware & Hudson Canal Co., and Thos. Prosser, Jr., was appointed for the purpose of making a canvass among railroad officials in New York city and other railroad centers, and obtaining expression of opinions as to the advisability of organizing such an association. The meeting then adjourned, subject to the call of the committee.

Western Railway Club.

175 DEARBORN STREET,
CHICAGO, Dec. 24, 1886.

Next meeting of this Club will be held in the Grand Pacific Hotel, Chicago, January 19, at 2 P. M.

The subjects for discussion are:

1st. Weight of driving wheels and tires; to be introduced by Mr. C. E. Smart.

Mr. Smart believes that a large proportion of the rapid wear of driving wheel tires and rails, is due to abrasion caused by the great rigid weight of driving wheel. He favors reducing the weight of driving wheels and tires, and transferring it, if necessary, to the boiler or frames when springs would intervene between it and the track. Facts bearing on this subject are scarce. Any one having information about it, who cannot attend the meeting, would confer a favor on the Club by communicating the same to the secretary in writing.

2nd. Rules of interchange of cars Nos. 12, 13 and 14. Mr. G. W. Rhodes will introduce this subject.

You are cordially invited to attend these meetings. For the committee, ANGUS SINCLAIR, Secretary.

THE ISAACS PATENT FLANGED LOCOMOTIVE TRACK BROOM, made of steel wire with the brush part fitted to the rail, is the only broom made that cleans the rail and flange at the same time. Its utility has been thoroughly tested for years past on a large number of leading roads subject to obstructions from snow and ice. The demand for these brooms has been steadily increasing and now exceeds that of any previous year. They are manufactured by the Phenix Steel Wire Broom & Brush Co., Chicago, which is running to its full capacity in filling orders.

THE CLAYTON AIR COMPRESSOR WORKS, No. 43 Dey street, New York, have issued a new catalogue of 64 pages, containing illustrated descriptions of the Clayton Improved Air Compressors, duplex or single, actuated by steam, belt or gearing. Also rock drills, hoisting engines, rock crushers, mining and boiler feed pumps, pneumatic locomotives, boilers, blasting batteries, fuse, exploders and complete mining and tunneling plants in general. Copies of catalogue, estimates and general information, will be mailed on application.

THE PROSPECT MACHINE AND ENGINE CO., Cleveland, O., have issued a new illustrated catalogue of 153 pages, containing detailed descriptions of the classes of engines manufactured by the company, and embodying a mass of information in reference to the purchasing and economical working and management of such engines. Every detal is elaborately treated, and there are numerous tables of dimensions, weights, sizes, etc., that will be found serviceable in all establishments where the products of the company are used. A copy of the catalogue may be had on application as above, and inclosing four cents postage.

THE DAYTON MANUFACTURING CO., Dayton, O., have issued a handsomely illustrated and descriptive catalogue of car lamps, embracing a variety of styles and patterns made by the company. The list includes hurricane chandeliers, center, side and deck lamps, caboose, inspectors', train signal, switch and station lamps; also lanterns, locomotive headlights, etc. The styles of finish are as numerous as the letters of the alphabet by which they are designated. The catalogue also contains a detailed table of prices.

MESSRS. PEDRICK & AYER, proprietors of the L. B. Flanders Machine Works, Philadelphia, have sent us one of their Memorandum Calendar Tablets for 1887, the design of which is a new departure in this line of advertising. There is a leaf for each week, exclusive of Sunday, with spaces opposite each day for memoranda, and each leaf bears the impression, in light blue ink, of a machine of the firm's manufacture, and at the top of the leaf is a brief description of the same.

THE corrugated iron work manufactured by the Cincinnat Corrugating Co., for roofing, siding, ceilings, etc., is a very effective safeguard against fire, and is more extensively used every year by the owners of mills and manufacturing establishments, to diminish the danger of conflagration and lessen the rates of insurance.

THE BYRAM & CO. IRON WORKS, Detroit, Mich., have recently shipped Colliau Cupola Furnaces to the Lebanon Mfg. Co., Lebanon, Pa.; Warder, Bushnell & Glessner, Springfield, O.; E. W. Ross & Co., Springfield, O.; Lappin Brooke Shoe Co., Newark, N. J., and I. P. Morris Co., Philadelphia.

A COMPANY has been organized to build cars at Curtis Bay, near Baltimore. The incorporators are gentlemen chiefly connected with the Baltimore & Ohio and the West Virginia Central & Pittsburgh roads. The present capital stock is fixed at $200,000, and shops for the building of freight cars only are to be erected at first, but it is expected that the stock will be increased, and passenger shops will be added hereafter.

IT is claimed that by a new process white wood can be made so tough as to require a cold chisel to split it. This result is obtained by steaming the timber and submitting it to end pressure, technically "upsetting it," thus compressing the cells and fibres into one compact mass. It is the opinion of those who have experimented with the process, that wood can be compressed seventy-five per cent. and that some timber which is now considered unfit for use in such work as carriage building could be made valuable by this means.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Boston & Albany.—Henry T. Gallup has been appointed General Superintendent, in place of Edward Gallup, who has gone to the Lake Shore.

Cairo, Vincennes & Chicago.—M. A. McDonald has been appointed General Manager, vice S. P. Wheeler, resigned.

Chicago, Burlington & Northern.—J. M. Horne has been appointed Division Superintendent in place of David Coleman, deceased.

Chicago & Atlantic.—George D. Brooke has been appointed Master Mechanic, vice Jacob Johann, resigned.

Hannibal & St. Joseph.—W. F. Merrill, late Superintendent of the Iowa lines of the C., B. & Q., has been appointed General Manager, vice J. F. Barnard, resigned.

Indiana, Illinois & Iowa.—T. P. Shouts has been appointed General Manager, and D. C. Murphy Superintendent.

Kansas City, St. Joseph & Council Bluffs.—W. F. Merrill has been appointed General Manager, vice J. F. Barnard, resigned.

Kansas & Gulf Short Line.—T. W. Clawson has been appointed Superintendent. The office of Master Mechanic is abolished.

Louisville, New Albany & Chicago.—James Long has been appointed Master Mechanic in place of A. F. McClatchy resigned, and A. S. Dunham, Purchasing Agent, vice Geo. W. Stevens, resigned.

Natchez, Jackson & Columbus.—E. D. Frost has resigned his position as General Superintendent.

New York City & Northern.—Ellis B. Edwards has been appointed General Superintendent in place of Frank S. Gannon, who has gone to the Baltimore & Ohio.

Philadelphia & Reading.—Thomas B. Russam has been appointed Acting Master Mechanic of the Central of New Jersey Division, in place of Wm. Woodcock, deceased.

Potomac, Fredericksburg & Piedmont.—W. P. Johnson has been appointed Master of Motive Power, vice W. J. Sweigard, resigned.

Texas & Pacific.—Jacob Johann has been appointed Superintendent of Motive Power and Rolling Stock, vice F. Mertsheimer resigned; and John A. Grant has been appointed General Manager, vice George Noble, deceased.

Valley (Ohio).—Wm. M. Smith has been appointed Superintendent, vice N. F. Wood, resigned.